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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

AERIAL ENGINEERING[1]

THE attention of the section was directed to aeronautics as long ago as 1886, when my distinguished predecessor, Octave Chanute, in his address at Buffalo, mentioned the possibilities of aerial navigation, a subject which entirely absorbed his later years and which he lived to see completely realized. Again in 1904, Professor C. M. Woodward devoted a portion of his vice-presidential address at Philadelphia to a consideration of the navigation of the air, which at that time had been accomplished with dirigible balloons. Papers on aeronautical subjects, or relating thereto, have been presented in increasing numbers to the section, reaching a maximum of eleven in 1909. Last year, the writer, as chairman of the section, made a special effort to secure such papers through a preliminary circular, thus worded:

> The rapid advance in the navigation of the air during the past year has attracted serious attention to scientific aeronautics. The construction of dirigible balloons and flying machines is essentially a mechanical problem and as such merits consideration by this section, especially since no engineering society has yet taken this action. Accordingly papers are invited relating to aerodynamics and other branches of aeronautics and also discussing possible courses of instruction in colleges and technical schools.

As a result ten papers were presented and an aeronautical curriculum was for the first time discussed here.

The subject of this address, "Aerial

[1] Address of the vice-president and chairman of Section D—Mechanical Science and Engineering. Washington, 1911.

Engineering," suggests a new field for the profession, analogous to marine engineering and which may in the future prove almost as important. So long as the spherical balloon was the sole method of rising in the air, the technical questions involved belonged to physics and chemistry rather than to engineering, but with the advent of the dirigible balloon and the aeroplane, the mechanical engineer was called upon to provide the lightest possible motive-power and to design the framework of the balloon and the supporting surface of the aeroplane to sustain the greatest stresses with the least weight.

The determination of the meteorological conditions at different heights and places and under all weather conditions belongs to the meteorologist and his observations originally made in the interest of pure science now become of practical value. The necessity of knowing the conditions which may be encountered by air-craft in their voyages through space of three dimensions will ultimately lead to the construction of flying charts at different levels but otherwise similar to the sailing charts for the ocean. A beginning has already been made by the writer, who has published a series of twenty-four charts based on material collected by the Blue Hill Observatory in the United States and over the Atlantic Ocean. Since in the air as on the earth it is not the average, but the individual thing, which happens, an attempt is made to specialize for the time of day and season and also to show the sequence of wind-changes aloft which accompany different barometric conditions at the ground. A knowledge of the wind, which varies with both place and level and depends upon the meteorological situation, has a far greater importance for the airman than for the navigator, whose vessel rests on a dense and relatively stationary medium. In general, the velocity of the wind increases with height and its direction becomes more constant, but the observations at Blue Hill seem to indicate that the gusts of wind, while increasing with the average velocity, decrease as we rise in the free air and are greatest near the ground in northwest winds, where they may be double the average speed. In experiments there by Mr. S. P. Fergusson, as many as ten pulsations per second were recorded by the most sensitive anemometers on a wide time-sheet. The uprush of air under cumulus clouds, which are especially strong when they become cumulo-nimbus or thunder-clouds, are dangerous to all air-craft that depend on dynamic equilibrium, as are the eddies termed by aviators "holes in the air," which are produced by superposed currents having different velocities or directions. It is possible for an aeroplane to fall when traveling with the wind if the gust greatly outstrips the mean velocity of the current that carries the aeroplane, which our experiments show to be a frequent occurrence, because its relative motion through the air, due to its motor, and therefore the upward component which furnishes support, is decreased by the inertia of the flying-machine preventing it from responding to the sudden impulse. The same thing may happen when going against the wind if a sudden lull occur, and if the aeroplane pass abruptly up or down into another air stratum of different velocity. Such local currents and atmospheric eddies, which have long been known to meteorologists from the behavior of their kites and balloons, will now be studied *in situ* and with danger by the aviator. Some of these disturbances may be counteracted by automatic control of equilibrium, but generally by increasing the speed and size of the machine and so rendering it less susceptible to the influence of those per-

turbations of the atmosphere which are of limited extent and duration. To-day the most needed improvements in aeroplanes are stability in wind-eddies and safety in landing.

The meteorological phenomena causing these difficulties are discussed here at some length because their solution belongs to mechanical science and therefore merits the attention of our best engineers. There is an erroneous idea that the aeroplane has been developed without laboratory experiments and that a study of the theory of flight, and hence the science of aviation, does not require theoretical knowledge of the different factors which influence it. The pioneers in aviation, Lilienthal, Maxim, Langley and the Wrights, experimented in the laboratory with surfaces exposed in wind-tunnels and on whirling-tables, and the best shapes for balloon-envelopes to present the minimum resistance to propulsion were also obtained from models. Theoretical knowledge based on experiments is indispensable to the aeronautical engineer as distinguished from the aviator. Only on such a foundation can we build up the new science of aeronautics and a technology which is indispensable for the development of this new branch of engineering.

M. Eiffel, the distinguished engineer, in describing the results of his recent work in aerodynamics says:

> It must be admitted that the experiments in the laboratory with small models can furnish data useful to aeronautical constructors, saving them both money and time in experimenting. For a series of laboratory experiments made on model aeroplanes, or on wings of small size, which can be quickly and surely modified, gives the basis for later computation, either for the section of the different members depending on the strength of the material used, or for the conditions of equilibrium and stability, having regard to the calculated or assumed weight for each member. The same thing applies to a model of a screw-propeller which tried under proper conditions may give information about the action of the actual propeller. The experiments with full-sized aeroplanes are almost always disturbed by wind, which introduces very large causes of error, and the trials being made necessarily with new apparatus of uncertain operation are generally dangerous. On the other hand, laboratory experiments can be conducted at any time and under different conditions and their results enable the knowledge of the engineer to replace the inspiration of the constructor, which in new fields may sometimes lead to fortunate discoveries, but may also give rise to costly mistakes.

The establishment of aerodynamical laboratories, therefore, marks the entrance of aeronautics into the domain of engineering. Probably the first of these was organized by Captain, later Colonel, Charles Renard at the Central Establishment for Military Aeronautics at Chalais-Meudon, near Paris, about 1884. Here important investigations on light motors and the resistance of bodies of different shapes to motion through the air were conducted, which resulted in the first successful dirigible balloon, *La France*. Experiments upon lifting screw-propellers, with a view to aviation, followed, and Colonel Renard carried on similar work until 1903, when he was succeeded by other officers and the name of the laboratory changed.

Important experiments on the resistance of the air to falling bodies were made between 1903 and 1906 by the eminent constructor of the Eiffel Tower there and later at his laboratory provided with a large wind-chamber on the Champs de Mars. Of great importance are the determination of the relations between the velocity and pressure of the air on a normal plane and upon plane and other surfaces at varying angles of incidence, the distribution of the pressure over the surface and the tests of aeroplane-wings. The results of the experiments have been published in two large volumes with the detail and elegance characteristic of M. Eiffel.

Another experimental establishment of wider scope has recently been created in France through the generosity of a patron of aeronautics, M. Deutsch de la Meurthe. This is the Aerotechnical Institute of the University of Paris, located at Saint Cyr, near the Buc aerodrome and the Satory camp, the center of military aeronautics in France. It is planned to study all theoretical and practical problems of aviation and aerostation relative to the support of bodies in the air, both at rest and in motion. The institute is primarily a testing establishment where constructors and experimenters may bring aeroplanes, or their parts, to be tested by the best devices at actual cost; and secondarily it is an institution where aerodynamics is studied in theory and in practise by experts for the government and some of the results are published as an aid to the science. The invested capital is $100,000 and an additional annual income of $3,000 is provided by M. Deutsch. The director of the institute is Professor Maurain, who has an advisory committee composed of eminent French scientific and aeronautical experts, including representatives of the University of Paris and the Aero-Club of France and government officials.

An earlier laboratory of the same nature in Russia was the Aerodynamic Institute of Koutchino, founded in 1904 by M. Riaboutchinski in connection with the University of Moscow. Its object is to investigate problems of pure and applied aerodynamics, general aeronautics and meteorology and three volumes containing results of the valuable investigations have been published. The initial cost of the plant was about $77,000 and the proprietor further donates some $27,000 a year for the researches.

An aerodynamical laboratory was established at Göttingen, Germany, in 1908, through the initiative of the Society for the Study of Motor Air-ships, aided by the Göttingen Technical Association, the government and the Krupp gun-firm, the laboratory receiving in the aggregate more than $7,000 a year. Professor Prandtl, who also holds the chair of aeronautics in the University of Göttingen, is director of the laboratory, and has as advisers Germans prominent in physics and engineering. In Austria there are at least two private experimental laboratories.

The National Physical Laboratory at Bushy Park, near London, now has an aerodynamical department with an advisory board composed of men eminent in different branches of science, Lord Rayleigh being the chairman, who are appointed by the prime minister. The experimental apparatus for investigating general questions in aerodynamics includes a wind-tunnel, a whirling-table, two wind-towers for experiments in the natural wind, a motor-plant and arrangements for testing the permeability of balloon and aeroplane fabrics and the strength of light alloys for construction. A report of the advisory committee for 1909–10 has been published as a government blue book.

There is a well-equipped laboratory in Italy for the military aeronauts and in other European countries similar establishments exist, the work of which is not disclosed.

From this rapid survey of the principal scientific establishments for the study of aeronautics in Europe, it will be seen that they may be divided into two classes: first, those privately endowed laboratories, which are either personal or connected with some institution but whose object is the advancement of the science and practise of aeronautics; and second, those supported by the government for military

purposes, but which may publish data of value to constructors and students.

Instruction in aeronautics is now given in many foreign technical schools and universities, the best known course of study being under Professor Prandtl at the University of Göttingen, in connection with the laboratory already mentioned. M. Basil Zaharon, a wealthy Greek residing in Paris, has endowed a chair of aeronautics at the Sorbonne with a fund of $140,000, so that France will soon rival Germany in facilities for training students in this science.

The United States is almost absolutely lacking to-day in aeronautical laboratories and technical instruction, for the brilliant researches in the past of Langley, Zahm and Nipher have not been followed by similar work since the flying machine was realized. Our government maintains no aerodynamic laboratory and few of our technical schools or colleges possess apparatus for this purpose, while none offer regular instruction though some investigations have been made by advanced students. The instruction in flying by the so-called aviation schools is, of course, unworthy of consideration, since the best of these only teach the aviator to operate and repair his machine as the automobile school does the chauffeur.

It appears likely that the demand for collegiate instruction from young men wishing to enter aerial engineering as a profession will soon require the establishment of regular courses of study based on the European curriculum, at the completion of which a degree or certificate of proficiency shall be given, ranking with that conferred in other professional courses. It seems to the writer that aerial engineering can best be taught in institutions that now possess departments of mechanical engineering and naval architecture, for the preliminary training would be the same as that now given in these studies and the specialization would consist in the substitution of air for water as the navigable medium. The installation of laboratories having powerful blowers connected with large wind-tunnels, or equipped with whirling-tables in a large enclosed space, is, of course, essential.

The board of governors of the Aero Club of America have requested the committee on aerodynamics to consider the most feasible method of organizing and maintaining an aeronautical laboratory in this country. This committee, of which the writer is a member, through its chairman, Dr. A. F. Zahm, has made a preliminary report containing the following suggestions. The fact that the United States Signal Corps and the Bureau of Navigation of the Navy Department will probably establish such laboratories for their officers, should not prevent the creation of a civil aeronautical institution similar to those already described in England, Germany and Russia. If the English precedent is followed, and the laboratory be maintained by the government, it could properly be attached to the Bureau of Standards, but if privately endowed, like those on the continent of Europe, it might become an adjunct of the Smithsonian Institution, and this would be the more appropriate because the institution through its late secretary has already undertaken extensive aerodynamical researches and still possesses workshops and a special library.

Two years ago our chairman, Professor G. F. Swain, in speaking of engineering as a profession, remarked that aeronautics was a peculiarly appropriate field for this section to occupy, because it had not been taken up to a considerable extent by the engineering societies. This is still true to-day and the object of this address is to

convince the members of this section and of our engineering societies of the importance of establishing aeronautical laboratories and courses of instruction in aerial engineering in America, in order to keep pace with their rapid development in Europe. The fundamental researches of our late associates, Langley, the physicist, and Chanute, the engineer, which first demonstrated the principles of dynamic flight, should be an incentive to further scientific work in this country towards its perfection.

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THE INDEPENDENCE OF THE CULTURE OF THE AMERICAN INDIAN[1]

If one considers for a moment a map of the world, the two American continents are seen to possess one obvious characteristic in which the other great land masses do not share—isolation. From the time of the discovery America has been known as the new world, and indeed the name seems well deserved. Europe, Africa and Asia together with Australia and most of the islands of the Pacific form a closely connected and nearly continuous area. Within its limits races have come and gone, civilizations and cultures have risen and passed away, but each has been to some extent directly or indirectly influenced by others, and strong cultures have made their effects felt, albeit but faintly sometimes, to the furthest limits of this old world. A Mongol chieftain once made all Europe tremble; the conquests of a Chinese king perhaps decreed the age-long wanderings of the Polynesians; and the visions of an Arabian epileptic were the cause of movements that have overthrown empires and profoundly influenced the life of men from the northern rim of Europe to the edge of the South African deserts, and from the Pillars of Hercules to the Spice Islands of the east.

To understand and analyze, therefore, the culture of any given people or portion of the old world, the possible far-reaching effects of other cultures even although remote, must be borne in mind. In this it would seem, however, that America might be excepted. As far back at least as history or tradition goes it has stood alone, touching that other and older world only in the frozen north, and when, at the time of the discovery, Spanish, French and English broke down its barriers of isolation, it was to reveal peoples and cultures which for centuries and perhaps millenniums had been developing their own civilizations apparently untouched, neither influencing nor being influenced by those of the old world.

Yet in spite of the apparent isolation in which the people of America lived, no sooner were they known than various general similarities between them and peoples of the old world were observed, and theory after theory was brought forward attempting to derive them or their culture *en bloc* from elsewhere. Some, mostly of the earlier period, looked to the Semites and the Lost Ten Tribes, others to China and a party of Buddhist monks; others still to the islands of the South Seas or to Egypt and the fabled Atlantis. All such theories, however, it need hardly be said, belong to the period before the present in which more accurate and abundant observation and careful scientific method are employed. In spite of the many such theories exploited, the majority of students refused to accept the conclusions, many indeed going to the opposite extreme. They admitted that the various cultures which, as a result of the activity of investigators, had been

[1] Address of the vice-president and chairman of Section H, Washington, 1911.

gradually outlined in the two Americas had unquestionably influenced one another, but they felt that although all American cultures might thus be in some degree interrelated, they had had no connection with any of the cultures of the old world. The similarities observed were thought to be coincidences due to the effects of similar environment and to the fundamental unity of the human mind. In short, so far as the history of culture was concerned, the new and old worlds formed two closed circles, tangent but not intersecting, within each of which different cultures had modified each other, but between which little or no interaction had taken place since human culture had attained to any real differentiation.

As our knowledge of different cultures both in America and elsewhere has come to be more detailed and their historical relations have become more and more apparent; as the methods of investigation have grown more exact and the criteria of relationship become more defined, the feeling has grown that after all, perhaps, the similarities between old and new world cultures might have a deeper meaning.

I may be permitted perhaps at this point to outline very briefly some of the methods and what seem to me to be some of the most reliable criteria of this so-called historical as opposed to the evolutionary school of anthropology. Such statements must indeed be trite, but will make clearer perhaps my argument further on. In essence the method depends upon the realization of the complexity of culture, that that of any given people is probably made up of elements derived from many sources, and that analysis must therefore precede a clear understanding. The analysis completed, the separate elements must be traced step by step and from tribe to tribe to determine their distribution. This necessarily involves much careful consideration of apparently insignificant details, close comparison of archeological material with modern forms, the sifting and weighing of historical traditions, and the searching analysis of dialectic and archaic forms of speech. If as a result of such study, similarities are found to exist between different tribes or peoples, this is regarded as evidence of a real historic relationship; either one tribe has borrowed directly or indirectly from the other, or both have felt the influence from a common source.

But in drawing such conclusions we must proceed with caution, and constantly test our conclusions by reference to certain general principles. Perhaps the most obvious of these is the possibility or probability of such relationship on geographic or historical grounds. Thus resemblances between one tribe in South Africa and another in Chile would afford little basis for assuming relationship in their cultures, as from their very wide separation and known history, no reasonable ground exists for assuming any possible connection. On the other hand, similarities between the people on a remote island in eastern Polynesia and others in Assam or southern China may be significant, as there exists a possible route by which cultural influences or even migrations might have taken place, and there is historical evidence of movements of population on a tremendous scale in just this direction.

Another factor of importance is that of continuity of distribution. If striking similarities are observed between two widely separated peoples and no trace appears, either among the living peoples intervening, or from archeological evidence, of any connecting links, and there is no evidence of migrations, we must be cautious in assuming any genetic or historical relationship, and adopt at least as a work-

ing hypothesis that the similarities are due perhaps to convergent evolution, and that the two phenomena are in origin independent. A third point must also be considered in this connection. In tracing cultural influences and relationships, especially over wide areas, it is not to be expected that the implement, custom or belief will remain throughout precisely the same. As we pass from tribe to tribe and from region to region modifications are almost certain to be made, either in accordance with the various tribal or national characteristics and inherited tendencies, or as a result of the varying environment under which the people live; the implement will vary as a result of new uses and materials, the custom or belief will change with the different habit of thought and attitude toward the world of different tribes.

Of great importance again in drawing inferences from the observed similarity between implements or customs in different areas is the character and relative complexity of the things between which the similarity exists. Thus that two widely separated peoples both make use of a simple dug-out canoe is no necessary indication of historical or genetic relationship between them, as this is one of the simplest forms of canoe possible, and one which any two peoples making use of wood as a material must almost inevitably hit upon. If, on the other hand, both peoples make use of a canoe of unusual shape or one which shows some peculiar technical features in its construction or ornamentation, then the possibility or probability of relationship between the two peoples is established and should the peculiarity moreover be known only among these two peoples the evidence would become all the stronger. Further, if the peculiarities are in one case dependent on and in close relation to the environment or necessitated by it, and in the other they show no such relation or are present only as useless or even detrimental features, the probability that the latter has in some way been derived from the former becomes great. The validity of the evidence for historical or genetic relationship thus is directly proportional to the unusualness or complexity of the things compared, features of very wide distribution or of very simple character being almost worthless for purposes of argument.

Lastly, if an attempt is made not merely to show relationship between single implements, customs or beliefs among different peoples, but to demonstrate a similar relation for an entire group of cultural elements, consideration should be given both to the question of the relative permanence and resistance to change of the different elements separately, and to the relative importance in the respective areas of the group of elements on whose similarities the claim for general cultural relationship is based.

The historical method in anthropological investigation, then, if it is to lead to trustworthy results, requires on the part of the student not only most careful and minute investigation and comparison of the facts themselves, but also the constant consideration of these in the light of their relation in time and space, their continuity, their modifications, their individual character and their relationship to the sum total of the culture of the respective peoples. That enthusiastic adherents of or converts to this historical as opposed to the evolutional school should be led away by their enthusiasm and in so doing neglect to give due weight to these considerations is natural. It is also natural that the conclusions so arrived at should often be striking and almost revolutionary. But although the results may not receive gen-

eral acceptance, and although the theories may even bear upon their face their own refutation, still they may serve a useful purpose. On the one hand they may exemplify the dangers to which the followers of the historical method are exposed, and on the other they may often direct attention to a group of facts whose significance has been overlooked.

Such an over-enthusiastic application of the historical method as regards the question of the independence of the culture of the American Indian is exemplified to my mind in the theory recently advanced of the real and fundamental relationship of American and Melanesian cultures; I refer to that put forward by Dr. Graebner in his "Die melanesischen Bogenkultur und Verwandtes." The conclusions reached by the author of this most striking and painstaking study are, it seems to me, of value in demonstrating both the strength and the weakness of the method. For the ethnology of Melanesia, Polynesia, Micronesia, Indonesia and Australia, together with the adjacent parts of southeastern Asia, Dr. Graebner's work is, I believe, in large measure valuable. It is where, abandoning the comparatively firm ground of Oceanic ethnology in which he is at home, he looks further afield, and finds in America (as indeed also in Asia, Africa and Europe) the evidences of a specific Melanesian culture, that I believe we must hesitate to follow him, and subject his facts and conclusions to careful scrutiny. General principles may often best be illustrated by concrete examples, and it is therefore with the idea of exemplifying some of the principles previously laid down, and not in any spirit of unfriendly criticism, that I propose to analyze and examine that portion of the theory of the Melanesian bow-culture which relates to America.

The theory in general may be summed up as follows. By a detailed analysis of the rather bewildering culture complexes of the closely interrelated peoples of Oceania, the conclusion is reached that a number of distinct cultures may be recognized, each marked by a coherent group of characteristic implements, usages, forms of social organization and beliefs; that these several cultures have spread successively over the region in question, and by their varied intermixture and superposition have produced the great complexity we find to-day. The various elements which go to make up the different cultures are regarded as so intimately interrelated and combined as to be practically inseparable, and as a particular combination to have had a definite origin in time and space. The occurrence of any considerable number of the separate elements of such a group among any given tribe or people is considered as sufficient evidence of the existence of the whole culture complex as an integral and historical feature in its development.

Of the various cultures so outlined and traced throughout Oceania, that of the so-called Melanesian bow-culture is taken up in most detail. The distinguishing characteristics of this culture are described as the self-bow of flat cross-section, arrows with fore-shafts, pile-dwellings, coiled pottery, twilled basketry, spoons, the hammock, paddles with handles at right angles to the shaft, bamboo combs, suspension bridges, the use of betel and tobacco and the pipe, hour-glass drums, communal dwellings, head-hunting and associated skull-cults, and the use of the squatting human figure and the spiral in art and design. Associated always closely with this culture is the two-class matriarchal culture, whose distinguishing features are in part the rectangular house with gable-roof,

plank-canoe, secret societies, masked dances and ancestral cults. Dismissing for the purposes of this enquiry the validity of these groups, and the correctness of the conclusions drawn in regard to their distribution in the Oceanic area, let us very briefly consider the evidence brought forward to prove their presence as fundamental and integral parts of American culture.

Beginning with North America, we find it stated that except for a few forms in the western United States which are of the type of the self-bow with flat cross-section, all other bows north of Mexico are either derivatives of the composite Asiatic or the reflexed, strengthened Arctic bow. Incidentally it may be noted that the statement could hardly have been more incorrect, as with few exceptions it is precisely in the west and on the Pacific coast that the strengthened bow is common, whereas the self-bow of rectangular cross-section is for the greater part of the eastern portion of the country the prevailing type. The presence, however, of the self-bow in North America is given as the first argument for the existence here of the Melanesian culture. It is to be noted, however, that this type of bow is almost the simplest and least elaborated form possible, the only simpler form being that where the stick has been left round in its natural state. Therefore the fact that this simple form of bow, which is in other parts of the world widely distributed, occurs both in America and in Melanesia does not constitute evidence of any historical relation between the two cultures.

For the Melanesian bow-culture in Melanesia, pile-dwellings are given as one of the most important characteristics, and their presence in America is signaled in Florida and on the northwest coast. So far as the first case is concerned, the rather obvious relationship to similar types in northern South America, and the known Antillean and South American influences which have affected the Floridian peninsula and the adjacent parts of the Gulf shores, are wholly ignored; and to regard the occasional instances of the use of wooden blocks a few inches in height under the foundations of northwest coast houses as traces of pile-dwellings seems to strain the theory of historical relationship to the breaking-point. Pottery of coiled technique is referred to as another link connecting Melanesia and America, but here again little importance can be given to resemblances in such a simple factor, for the coil process is one of the most common methods employed in pottery-making by people the world over where the potter's wheel is not known. Twilled basketry is attributed to the Pueblo and Muskogean tribes, but its possible historical connection in the latter case at least, with Antillean and South American types, and its partial dependence on material, are both overlooked. The use of spoons which, contrary to the author's statements, is very widespread in North America, is a further striking example of an extremely simple implement, not whose peculiar form or decoration, but whose mere existence is regarded as evidence of cultural relation. Similarly without real value and in part erroneous as to fact, are the references to the paddle with handle at right angles to the shaft, and to communal dwellings. Since paddle shafts must either end in some form of cross-handle or be, like a broom-handle, without the cross-grip; and since dwellings must be either communal or not communal, there being no tertium quid, it hardly seems that the presence of one of the only two possible forms in each case should be regarded as evidence of cultural influence or identity.

On the basis of facts such as these which have been given as examples, and without further study or investigation of American cultures themselves, it is assumed that the Melanesian bow-culture may be traced as an essential factor in North American civilizations. In the brief discussion of the several instances given, it is apparent that not only does the writer show too slight an acquaintance with the facts relating to North America, but he violates in every case almost, the principle that the things compared and found similar if they are to prove real relationship, must in themselves possess some distinctive character, and not be simple and widely distributed. Dr. Graebner's theory, moreover, assumes that these elements of Melanesian culture reached America by way of northeastern Asia and Bering Strait, and while this is perhaps not wholly beyond the bounds of possibility geographically, it is contradicted by practically all historical and other evidence and probability. With few exceptions there is no evidence that cultural elements have passed from Asia eastward to America by way of Bering Straits, but on the contrary much evidence has in the last few years been brought forward to show that in fact the reverse has occurred, and that American influences have passed westward into Asia.

For North America, therefore, the case for the Melanesian bow-culture seems extremely weak, and indeed Dr. Graebner himself admits that, as compared with South and Central America, his evidence is scanty. It is necessary thus to examine briefly the argument presented for the presence of this Melanesian culture in the southern continent. At the very outset one is, to say the least, surprised to find in passing that solely from the occurrence of skin cloaks, round huts and coiled basketry, the Fuegians are regarded as representatives of the early Australian culture. The willingness here shown to rest conclusions of far-reaching import on foundations of such extremely tenuous nature, can not fail, it seems to me, to lead us to look with some distrust at the author's other conclusions, and to accept them only with great caution.

Turning, however, to the Melanesian bow-culture, the area where this makes itself most strongly felt is said to be the northern and northwestern part of the continent. Here the self-bow of flat cross-section is the prevailing type; here in Guiana, Venezuela and Colombia the pile-dwelling is found; and here pottery (simply as such) is said to reach its highest development. In respect to the latter, a further instance is given of the author's incomplete acquaintance with the field with which he is dealing, in that the distribution given for pottery as "south as far as the Gran Chaco" wholly ignores the well-known fact of its extension to central Chile and far into Patagonia. Simple twilled basketry which is well-nigh universal throughout the northern two thirds of the continent is again brought forward as evidence of Melanesian influence, as is the use of tobacco and the pipe, the hammock and the paddle with cross-handle. Other elements noted are communal houses, head-hunting and skull-cults, and the use of the squatting human figure and the spiral in art. Associated with the Melanesian bow-culture in Melanesia itself is the so-called two-class matriarchal culture, and elements belonging to it, in the form of masked dances, knobbed clubs, plank canoes, pan-pipes and signal-drums are found also in South America. The fact that the chief center for all these elements of Melanesian culture lies in the northern and northwestern part of the continent suggests, says Dr. Graebner, their intrusion from Cen-

tral America and Mexico, where indeed he proceeds to show their presence.

In respect to most of the evidence thus brought forward for South and Central America, the same criticisms may be made as in the case of North America, and in many instances with added force. Here, as there, the mutual relations of the various cultures within the area are largely overlooked, and such well-established facts as that of the northward dispersal and migrations of the Carib and Tupi tribes are completely ignored. The propriety also of assuming that a feature so characteristic and widely distributed in South and Central America as the hammock has been introduced there from Melanesia where its occurrence is, on the contrary, extremely rare, seems rather questionable.

One of the strongest arguments against the validity of the Melanesian bow-culture theory as outlined by Dr. Graebner is, however, furnished curiously by the author himself, in the very abundance of the evidence and the closeness of the similarities which he claims for South America. The essence of the theory is that this Melanesian culture has, as a coordinated and intimately connected group of elements, been transmitted as a unit to the southern continent by way of eastern and northeastern Asia, Bering Straits and North America. Now as the theory has not the temerity to assert the actual migration of Melanesian peoples from Melanesia through Asia and North America to the southern continent, it follows that the spread of the culture-complex must have been in the nature of a slow transmission from tribe to tribe, each in turn receiving the various elements, and incorporating them into the fundamental structure of its culture, before transmitting them to the next. That any such heterogeneous and not inherently related group of cultural elements could survive unchanged transmission through scores of different tribes belonging to several distinct races; passing through the whole gamut of varied environments from the tropics to the Arctic circle and back again to the tropics; such transmission lasting necessarily over a period which must be reckoned in centuries or thousands of years; this is an assumption which is not merely beyond reasonable probability but is contradicted by almost all historical and ethnological evidence. It is to deny absolutely the well demonstrated fact that cultural elements when borrowed are subject to far-reaching and often fundamental modifications in accordance with the peculiar psychological characteristics of the borrowers and the environment in which they live; it is to assume that not even in the case of such absolutely elementary and natural things as the use of the skins of animals as protection against the weather, or of a spoon or a communal dwelling, could these have been developed independently and without historical relation; it is, in spite of Dr. Graebner's disclaimer, to throw aside the hard-learned lessons of the past two or three decades derived from the study of mythology, and to revert to the standards of a previous generation, and assume that similarities, whatever their nature and wherever they may be found, can only be explained as due to a common origin.

If then we must, as I believe, regard the theory proposed by Dr. Graebner of the presence of a Melanesian bow-culture in America as in no sense demonstrated, as fundamentally false in method and as exemplifying the most extreme position in the revolt against the theories of independent development, it does not follow that it must be barren of results. Indeed, its value lies, it seems to me, in the fact that it calls serious attention to the existence of

a really remarkable series of parallelisms between certain elements of American and Oceanic cultures, some of the more important of which, however, to my mind, the theory as proposed fails to note. That such parallels existed has for years been known, but hitherto little systematic attempt has been made to gather or explain them. The obvious suggestion has of course been made that they were the result of culture contacts along the Pacific Coast, of Oceanic with American peoples, but beyond this, little has been done. In part this has no doubt been due to the fact that most investigators have felt that our knowledge, particularly in regard to South America and much of Oceania itself, was still too incomplete to make a detailed study of the question profitable. Although I share in this feeling, I may perhaps be permitted in closing to point out a few of the facts which seem to me of special significance, and to urge the need of very thorough investigation of the whole field.

To my mind the most striking and for the purposes of tracing cultural relations, perhaps most important elements in common between the Oceanic area and America are, the true plank canoe, the use of a masticatory with lime, head-hunting and associated skull-cults, the blow-gun, throwing-stick, the hammock and perhaps the institution of the men's-house and certain peculiar masked dances and forms of masks in use in Papuan Melanesia and in America only in parts of Brazil. Of these the first three are either wholly confined to or reach their highest development on the Pacific coasts of both American continents, and the last three (with the exception perhaps of the men's-house) together with the third and fourth are confined to northwestern and northern South America and the immediately adjacent parts of Central America, with, in the case of the blow-gun, such parts of North America as have been influenced by Carib and Arawak cultures. Compared with the self-bow, the use of coiled pottery, twilled basketry, the spoon, paddle with cross-handle and the communal dwellings of the Melanesian bow-culture, these are for the most part far from being simple affairs, and occur, moreover, with few exceptions, only in America and Oceania together with the adjacent parts of southern Asia. Six at least of the elements (the plank canoe, use of a masticatory with lime, head-hunting and skull-cults, blow-gun, men's-house and peculiar form of mask and masked dances) may be said to be in varying degrees exotic in American culture, in that their distribution is limited and that they are in contrast to the usual and prevailing American types. Four at least (the plank canoe, use of a masticatory with lime, head-hunting and skull-cults and the institution of the men's-house) are on the other hand of very wide and continuous distribution in Melanesia, Indonesia and southeastern Asia. To this list of cultural coincidences may be added among others the curious and ingenious process of polychrome dyeing known in Indonesia as Ikat, and which occurs except for the region of Indonesia and adjacent southeastern Asia nowhere else, so far as known, but in Peru.

In any attempt at explanation of these facts, the strong concentration of the elements in America on the Pacific coast and in the western portions of the two continents, and their almost total absence in the eastern parts, seems of considerable importance. In this connection the as yet only fragmentary evidences of early migrations in South America from the Pacific coast eastward into the Orinoco-Amazon area must not be lost sight of. From this distribution, the explanation

which most readily suggests itself is of course the old one of direct contact along the Pacific coast. Elements of material culture might well be adopted thus as a result of the chance drifting ashore of a canoe with a handful of survivors, or even without these, from the region to the west; and the sporadic character of the occurrence of such features as the plank canoe, known only in Chile and on the coast of southern California, might thus naturally be explained. The difficulty, however, in attempting to explain the whole problem in this way lies in the fact that it is not with the migratory and sea-roving Polynesians that the cultural coincidences are strongest, but rather with the Papuan (as opposed to the Melanesian) tribes of New Guinea and with the older cultures of Indonesia. The Papuan tribes are not, so far as we know, a markedly seafaring people, and so far no evidence of their actual presence east of the 180° meridian has come to light. The people of Indonesia also, among whom the resemblances are found, although far more capable navigators, have nevertheless left no certain traces of their presence to the eastward of the Moluccas and the western end of New Guinea. Moreover, the Polynesians could hardly have served as the intermediaries through whom these elements were transmitted, as they themselves show, except for the plank canoe, little trace of them. Unless, then, strong evidence should come to light of an earlier more easterly extension of Papuan and Indonesian peoples, or some explanation be offered for the almost complete absence of the features in question among the Polynesians, the solution of the problem by supposing a direct transmission across the Pacific seems barred by the facts of geographic position and history. A similar result seems also to appear if the attempt is made to trace the elements by way of the Asiatic and North American littoral. Thus in the present state of our knowledge, neither by way of the long, circuitous route through Asia, Bering Straits and Alaska, nor by the more direct route across the Pacific can we satisfactorily account for the series of striking coincidences in culture between western America and particularly western South America, and Oceania with the neighboring parts of southeastern Asia.

Such a negative conclusion or verdict of "not proven" is generally most unsatisfactory. In the present case, the coincidences are so striking, in both character and distribution, that we are almost forced to believe in some sort of historical connection. But I believe we should for the present continue to be cautious. The possibility of independent development must not be denied even in the case of these quite peculiar features, nor need the fact that only a portion of the American peoples showing coincidences live in similar tropical or semi-tropical environment be regarded as a serious objection to this hypothesis.

To revert again to my title, I believe that in the present state of our information, we must still regard American Indian culture as in all its essentials and in most of its details, as of independent growth, uninfluenced by the cultures of the old world, and recognize that its geographical isolation has in fact proved to be a cultural isolation also, and that although certain curious coincidences undoubtedly exist with parts of Oceania and southeastern Asia, no historical relationship between the cultures of the two widely separated regions can as yet be said to have been established. That with increasing knowledge historical relations may indeed be shown seems to me wholly possible, but its demonstration must rest

upon that fuller knowledge of fact and of the historic sequence of cultures in the respective areas, and on the practise of the general principles of evidence some of which I have here attempted to set forth and illustrate.

Anthropologists are at present, as was recently pointed out by Dr. Rivers in his address as vice-president of the section in the British Association, in the unfortunate condition of not agreeing on fundamental questions of method. We have, it is hoped, left behind us the period of vague and futile theorizing without facts or with too few facts, but there are still many who believe that evolution is the master-key which will unlock all doors, and that by the amassing of more or less heterogeneous and unrelated facts from all over the world a continuous development through definite stages of culture may everywhere be shown. The partizans of independent development based on the theory of the psychological unity of the human mind, are set over against those who believe in the complexity of cultures, and the possibility that by analysis and comparison their historic relationships may be determined, and who would explain similarities in culture between widely separated peoples on this basis or on that of convergent evolution. Here in America we have come to feel, I think, more perhaps than elsewhere, that no one of these theories is a panacea. As a result of the experience of the last decade or so in attempting to outline and define the several culture areas in this continent, we are beginning to realize that these several points of view may all and at the same time be true, and to admit that in a given culture, whereas some elements are undoubtedly the outcome of contact or transmission, others may be the result of evolutionary development, and dependent on the general uniformity of reaction to similar stimuli among mankind as a whole; and we are prepared, I trust, to agree that if fact and theory do not conform, it is the latter for which the Procrustean bed should be reserved.

It is in this spirit, then, of insistence on abundant fact and its careful interpretation, without prejudice and unencumbered with rigid theories which will admit of no compromise, that I believe we should approach the question of the independence of American culture; a question which has its greatest interest quite naturally for us in America, but which for anthropology as a whole is also of great and far-reaching importance.

ROLAND B. DIXON

THE PERCENTAGE OF WOMEN TEACHERS IN STATE COLLEGES AND UNIVERSITIES[1]

THE average per cent. of women teachers for all the state colleges and universities is 9+. The average for the schools west of the Mississippi is 13+ per cent., while for the schools east of the Mississippi it is 6+ per cent.

Eleven schools,[2] which were selected at random, have 149 women teachers. Of these 149, 10+ per cent. are full professors, 5+ per cent. are associate professors, 10+ per cent. are assistant professors and 73+ per cent. instructors.

As to the subjects these 149 women teach, the distribution is: professors, home econom-

[1] These figures base upon "Statistics of State Universities and other Institutions of Higher Education Partially Supported by the State," for the year ended June, 1910 (Washington, Government Printing Office), and catalogues of eleven institutions for the year 1910.

[2] The eleven schools are: University of Arizona, Iowa State College, Miami University, University of Montana, University of New Mexico, North Dakota Agricultural College, Ohio University, University of Oklahoma, University of South Dakota, University of Utah, University of Wyoming.

Name of Institution	Professors and Instructors: Women	Professors and Instructors: Total	Per Cent. of Women Teachers
Alabama Polytechnic Institute	0	65	0
University of Alabama	0	54	0
University of Arizona	11	42	26+
Un versity of Arkansas	19	133	14+
University of California	6	297	02+
University of Colorado	14	141	09+
State Agricultural College (Colo.)	11	67	16+
Colorado School of Mines	0	20	0
Connecticut Agricultural College	5	24	20+
Delaware College	0	27	0
University of Florida	0	22	0
Florida State College for Women	14	25	56
University of Georgia	0	48	0
Georgia School of Technology	0	48	0
North Georgia Agricultural College	2	15	13+
University of Idaho	9	51	17+
University of Illinois	53	565	09+
Indiana University	10	179	05+
Purdue University (Ind.)	9	156	05+
Iowa State College of Agriculture and Mechanic Arts	33	142	23+
State University of Iowa	14	165	08+
University of Kansas	28	187	14+
Kansas State Agricultural College	44	157	28+
State University (Ky.)	4	67	05+
Louisiana State University and Agricultural and Mechanical College	3	59	05+
University of Maine	2	77	02+
Maryland Agricultural College	0	29	0
Massachusetts Agricultural College	0	41	0
Massachusetts Institute of Technology	1	223	004+
University of Michigan	4	317	01+
Michigan State Agricultural College	21	104	20+
Michigan College of Mines	0	30	0
University of Minnesota	9	193	04
Mississippi Agricultural and Mechanical College	0	53	0
University of Mississippi[3]	0	32	0
University of Missouri	12	162	07
Montana College of Agriculture and Mechanic Arts	10	45	22+
Montana State School of Mines	0	7	0
University of Montana	5	24	20+
University of Nebraska	42	261	16+
University of Nevada	9	40	22+
New Hampshire College of Agriculture and Mechanic Arts	0	35	0
Rutgers College (N. J.)	7	56	12+
New Mexico College of Agriculture and Mechanic Arts	6	33	18+
University of New Mexico	5	16	30+
New Mexico School of Mines	0	8	0
Cornell University (N. Y.)	16	636	02
University of North Carolina	0	99	0
North Carolina College of Agriculture and Mechanic Arts	0	45	0
North Dakota Agricultural College	10	62	16+
State University and School of Mines (N. Dak.)	12	77	15+
Ohio University	24	58	41+
Ohio State University	14	214	06+
Miami University (Ohio)	8	53	15+
University of Oklahoma	11	63	17+
Oklahoma Agricultural and Mechanical College	12	63	17+
Oregon State Agricultural College	19	89	21+
University of Oregon	8	102	07+
Pennsylvania State College	10	149	06+
Rhode Island State College	5	27	14+
South Carolina Military Academy	0	13	0
Clemson Agricultural College (S. C.)	0	48	0
University of South Carolina	3	32	09+
South Dakota Agricultural College	7	52	13+
South Dakota State School of Mines	0	16	0
University of South Dakota	12	46	26+
University of Tennessee	9	143	06+
University of Texas	6	103	05+
Agricultural and Mechanica College of Texas	0	52	0
Agricultural College of Utah	11	58	18+
University of Utah	16	74	21+
University of Vermont and Agricultural College	1	89	01+
Virginia Polytechnic Institute	0	64	0
University of Virginia	0	76	0
Virginia Military Institute	0	22	0
College of William and Mary (Va.)	0	20	0
State College of Washington	10	77	12+
University of Washington	4	103	03+
West Virginia University	15	91	16+
University of Wisconsin	38	459	08+
University of Wyoming	14	43	22+

[3] From 1909 report.

ics, 3; English, 2; modern language, 2; history and Spanish, 1; philosophy, 1; political science, 1; school training, 2; fine arts, 1; physical education and elocution, 1, and clinical medicine, 1.

Associate professors: English, 2; chemistry, 2; domestic science, 1; mathematics (and dean), 1; commercial, 1; library science, 1.

Assistant professors: English, 7; domestic economy, 3; Latin and Greek, 2; philosophy, 1; mathematics, 1; public speaking, 1; history, 1.

Instructors: music, 20; modern language, 14; English, 13; natural science, 8; school training, 7; history, 8; physical education, 6;

art, 6; commercial branches, 5; mathematics, 4; domestic science, 5; public speaking, 3; ancient languages, 2; mechanical drawing, 2; kindergarten, 2; Latin and English, 2; elocution and physical culture, 1; pediatrics, 1.

The groups for which women qualify are therefore, in order of frequency: English, music, modern language, domestic science and home economics. In natural science and mathematics they do not often rise above the rank of instructor.

The high per cent. of women teachers west of the Mississippi may be explained by saying that the west is less conservative than the east; that there are more coeducational institutions in the west; that the western schools were founded after women began to compete for college positions, while the majority of eastern schools were founded before this time. Lack of ample funds may also at times have dictated the choice of cheaper service.

The number and per cent. of women in the various schools is given on page 56.

C. H. HANDSCHIN

SCIENTIFIC NOTES AND NEWS

MR. ARTHUR D. LITTLE, of Boston, was elected president of the American Chemical Society at the Washington meeting.

PROFESSOR E. G. CONKLIN, of Princeton University, has been elected president of the American Society of Naturalists.

PROFESSOR ROSS G. HARRISON, of Yale University, was elected for the coming two years president of the American Association of Anatomists at the recent Princeton meeting.

DR. S. J. MELTZER, of the Rockefeller Institute for Medical Research, has been reelected president of the American Physiological Society.

THE Academy of Natural Sciences of Philadelphia has awarded the Hayden Medal in gold for distinguished work in geology to Professor John C. Branner, of Leland Stanford Jr. University.

PRESIDENT TAFT has nominated Dr. Rupert Blue, of South Carolina, as surgeon general of the public health and marine hospital service, succeeding the late Dr. Walter Wyman. President Taft gave notice that hereafter the term of service of the surgeon general of the public health service shall be limited to four years.

M. HENRI BERGSON, professor of philosophy at the Collège de France, has been appointed visiting French professor of Columbia University for the year 1913. M. Bergson has also been appointed Gifford lecturer at Edinburgh.

THE organ of the Japan Peace Society gives an account of the visit of Dr. David Starr Jordan, president of Stanford University, in August, September and October, of last year, undertaken under the auspices of the Japan and American Peace Societies. Dr. Jordan gave a large number of addresses, mainly on peace and arbitration, at Tokyo, Yokohama, Sendai, Nagoya, Okayama and Osaka. At Tokyo between September 13 and 18, Dr. Jordan gave as many as ten addresses, not including after-dinner speeches.

DR. W. A. CANNON, of the Desert Laboratory, is acting director of the Department of Botanical Research of the Carnegie Institution during the absence of Dr. D. T. MacDougal, who is traveling and studying desert conditions in Upper Egypt and portions of the Soudan.

MR. MYRON L. FULLER, for many years a geologist on the United States Geological Survey and chief of the Eastern Section of the Division of Hydrology from 1903–07, has formed an association with Mr. Frederick G. Clapp, also formerly of the Geological Survey, to act as consulting experts in all branches of geological engineering, especially in water supplies, bridge and dam foundations, ore deposits, oil and gas.

THE *Strand Magazine* has obtained a vote to determine the ten greatest men now living. The speaker of the house of commons drew up a list of eighteen men and other distinguished men voted for names by reduction and substitution. The final list in the order of the number of votes was: Edison, Kipling, Roosevelt, Marconi, Lister, Chamberlain, Roberts, William II., Metchnikoff.

Dr. A. D. Imms, professor of biology, University of Allahabad, has been appointed forest zoologist to the government of India.

A Reuter's telegram states that Dr. Kinghorn, who is at present in Northwestern Rhodesia, has transmitted the *Trypanosoma rhodesiense* by means of *Glossina morsitans*.

At a meeting of the Pellagra Investigation Committee on December 12, in London, Dr. Louis Sambon and Dr. A. J. Chalmers gave an account of the work of the Field Commission on Pellagra, from which they have just returned. The commission visited Hungary, Roumania, the Austrian Tyrol, North Italy and Spain, examining the districts in the several countries where pellagra prevails.

Dr. Willis Rodney Whitney, director of the research laboratory of the General Electric Company, lectured before the Middletown Scientific Association on January 9, his subject being "Research Laboratory Notes."

Professor G. F. Swain, of Harvard University, has returned to Cambridge from a trip to the middle west, where he gave the annual Sigma Xi lectures at the University of Kansas, the University of Missouri and Washington University.

At the recent meeting of the American Physiological Society in Baltimore Dr. W. B. Cannon, of the Harvard Medical School, delivered a memorial address on the late Professor Henry Pickering Bowditch.

Major Clarence Edward Dutton, U.S.A., retired, distinguished for his services in the civil war and later in the ordnance corps of the army and eminent for his contributions on volcanoes and earthquakes, died on January 4 at his home in Englewood, N. J., aged seventy years.

Dr. Arthur V. Meigs, of the third generation of a family of noted physicians and surgeons, and widely known as a physician and author of medical works, died on December 31 at his home in Philadelphia, at the age of sixty-one years.

Mr. George R. M. Murray, F.R.S., for many years on the staff of the department of botany of the British Museum, known for his contributions on fungæ and algæ, died on December 15, aged fifty-three years.

M. Paul Topinard, the distinguished French anthropologist, has died at the age of eighty-one years.

M. Radau, member of the astronomical section of the Paris Academy of Sciences, has died at the age of seventy-seven years.

Professor Odilon Marc Lannelongue, the celebrated pathologist and surgeon, died in Paris on December 22, at the age of sixty-one years. At the time of his death he was president of the Paris Academy of Medicine and a member of the French parliament.

The third annual meeting of the Paleontological Society was held at the new National Museum building, December 28–30, 1911, with 59 of its 136 members present. The results of the election of officers for the society for 1912 were as follows:

President—David White, Washington, D. C.
First Vice-president—J. C. Merriam, Berkeley, Cal.
Second Vice-president—Rudolf Ruedemann, Albany, N. Y.
Third Vice-president—E. W. Berry, Baltimore, Md.
Secretary—R. S. Bassler, Washington, D. C.
Treasurer—Richard S. Lull, New Haven, Conn.
Editor—Charles R. Eastman, Cambridge, Mass.

The American Society for Pharmacology and Experimental Therapeutics held its third annual meeting in the Pharmacological Laboratory of the Johns Hopkins University, December 27 and 28. Thirty-one papers and demonstrations were presented and discussed. On the afternoon of the 27th there was a joint meeting with the American Physiological Society. Dr. J. J. Abel was reelected president and Dr. John Auer was elected secretary. The following new members were elected: T. S. Githens, of the Rockefeller Institute; Y. Henderson, of the Yale Medical School; D. R. Hooker, of the Johns Hopkins Medical School; L. Nelson, of the Harvard Medical School; J. D. Pilcher, of the Western Reserve University Medical School, and G. B. Roth, of the University of Michigan.

THE seventeenth meeting of the Association of Teachers of Mathematics for the Middle States and Maryland was held at Columbia University on Saturday morning and afternoon, December 2. The morning program consisted of the following papers: (1) "An Allegation applied to the Calculations of Analytical and Industrial Chemistry," by W. A. Ballon, Pratt Institute; (2) "What Subjects in the High School Mathematics are of Greatest Use in Preparation for Analytical Geometry and Calculus in College," by W. J. Babt, of the University of Pennsylvania, and A. S. Gale, of the University of Rochester. In the afternoon the program consisted of (1) "Educational Values in Mathematical Instruction," by H. E. Hankes, of Columbia University; (2) "Provisional Report of the National Geometry Committee of Fifteen," by Howard F. Hart, of the Montclair High School. The following officers were elected:

President—I. J. Schwatt, University of Pennsylvania.

Vice-president—A. E. King, Erasmus Hall High School, Brooklyn.

Secretary—H. F. Hart, Montclair High School, Montclair, N. J.

Treasurer—Susan C. Lodge, Philadelphia Collegiate Institute, Philadelphia.

Council Members—A. S. Gale, University of Rochester, Rochester; J. T. Rowe, Wm. Penn High School, Philadelphia; Harry English, Division of High School Mathematics, Washington.

THE first annual dinner of the Edinburgh University Club of North America, was held on December 27, at the University Club in the City of New York. Professor Clarence Webster, Chicago, the president of the club, occupied the chair, and about sixty alumni of Edinburgh University were present. Congratulations upon the birth of the club were received from the chancellor of the university, the Right Hon. Arthur J. Balfour, M.P., from Principal Sir William Turner, K.C.B., from the last lord rector, Lord Haldane, of Cluan, from the university parliamentary representative Sir Robert Baunatyne Finlay, from Sir Alexander R. Simpson, Dr. George A. Gibson and others. The Hon. Joseph H. Choate, LL.D., Edin., discoursed eloquently upon "Our Alma Mater"; the Right Rev. Frederick Bishop Courtney, upon "Scottish Character"; Professor Prince, Ottawa, Canadian Commissioner of Fisheries, upon "United States" and Sir James Grant, Ottawa, upon "Canada." The club bard, Mr. Robert Easton, charmed every one with his rendering of Scotch songs. Great enthusiasm prevailed. The first function of the club was a marked success. Graduates and undergraduates of the university are eligible for full membership of the club. Fellows and licentiates of the Royal Colleges and postgraduate students of Edinburgh University may, as associate members, attend the annual dinners. Any who are interested are invited to communicate with the secretary, Edinburgh University Club, 20 East Sixty-ninth St., New York City.

WE learn from the *British Medical Journal* that on December 6 a dinner was given to welcome Professor Newstead on his return from the sleeping sickness expedition to Nyasaland and to wish godspeed to Dr. Harald Seidelin on his departure on a yellow fever expedition to Yucatan. Owing to having contracted a chill, Professor Newstead was unable to be present. Sir William H. Lever, who was in the chair, in proposing the toasts of the evening, remarked that the trustees of Sir Alfred Jones had intimated that they would come to the assistance of the school, and, in addition to better accommodation in Liverpool, it was proposed to establish a laboratory on the West Coast of Africa, where investigations into tropical diseases might be made on the spot. The government had given support to their movement, but he considered it was not adequate, and he echoed Sir Owen Phillips's opinion that it should grant to the London and Liverpool Schools £10,000 annually. If America had succeeded in making the Panama zone healthy, there was no reason why they should not, with adequate financial support, make West Africa sanitary.

A MEETING of the trustees of the Beit Memorial Fellowships for Medical Research was held on Tuesday, December 19, when ten fellows were elected. Each fellowship is of the

annual value of £250. The usual tenure is for three years, but the trustees have power in exceptional cases to grant an extension for one year.

UNIVERSITY AND EDUCATIONAL NEWS

Mr. Jacob H. Schiff has given $100,000 to Cornell University to promote studies in German culture.

The million dollar fund for the further endowment of the Medical School of Western Reserve University has been completed.

De Pauw University has just brought to a successful close the campaign to raise $400,000 to meet the conditional gift of $100,000 from the Rockefeller Educational Board. The subscriptions total a little more than $440,000. This will make the productive endowment of the university something above $1,000,000.

On December 13 an anonymous gift of £30,000 was made to the University of London, to be devoted to the erection at University College of the buildings for the new school of architecture, resulting from the amalgamation of the architectural department of University College and King's College. Any balance is to be used for providing studios for the teaching of sculpture and the rearrangement of the school of fine art and for the department of applied statistics, including the laboratory of eugenics.

The Supreme Court of Illinois, on the final day of its fall term, failed to hand down a decision in the case involving the validity of the appropriation made by the legislature for the Medical School of the University of Illinois.

Following the custom of recent years, the United States government has sent officers of the army and navy to the Massachusetts Institute of Technology to receive instruction in electrical engineering. These are in addition to the graduates of the Naval Academy who are sent to take a course in naval architecture. This year the Naval Academy is represented by Ensign G. K. Calhoun, who was graduated from Annapolis in 1908. He has recently been stationed at the United States Naval Observatory at Washington where he has done considerable original work in wireless telegraphy, ship propulsion, gyroscopic compasses and chronometers. The army is represented by Captain Edward Canfield, West Point, 1901, and First Lieutenant F. Q. C. Gardner, West Point, 1904. Both officers have been connected with the Coast Artillery Corps, Captain Canfield being stationed at Puget Sound and Lieutenant Gardner at Fortress Monroe. Both men will pursue a special course in electrical engineering.

The council of the University of Paris has sanctioned a scheme for an exchange of students between the universities of Paris and London.

The Veterinary School of Lyons, France, said to be the oldest in the world, will celebrate the hundred and fiftieth anniversary of its foundation next May.

Dr. Clyde A. Duniway, of the University of Montana, has been informed by the Board of Control that he will not be reappointed as president of the university. It is understood that this action has been taken because President Duniway refused to appoint a local politician as dean of the law school of the university.

DISCUSSION AND CORRESPONDENCE

WHAT IS BIOLOGY AND WHAT IS A "BIOLOGICAL SURVEY"?

The occasion for the present note is found in the recent publication of "A Biological Survey of Colorado."[1] Probably most students of plants and animals have long wished that the word "biology" had never been coined. It is so often misunderstood by the non-scientific person. In the days of the old taxonomy and of the former rigid morphology there were few people really interested in both plants and animals. With the advent of ecology, and more recently of genetics, botanists and zoologists have been brought together and

[1] Issued as "North American Fauna," No. 33, as a publication of the Bureau of Biological Survey, Washington, 1911. The author, Merritt Carey, is stated to be "Assistant Biologist, Biological Survey."

it has seemed that perhaps there might be, after all, such a subject as "biology."

But now when it seemed that the word "biology" might really have a meaning there is issued from Washington this report, which even at very first glance belies its title. The real nature of the publication is indicated in the "Letter of Transmittal" in which it is stated that

> The report consists of three parts. The first characterizes the five life zones which traverse the state, defines their extent and limits and discusses their agricultural possibilities. The second consists of a complete list of the mammals of Colorado with brief notes on their habits, distribution and economic relations. The third is a list of the principal trees and shrubs of the state observed by the assistants of the biological survey during the progress of work in the state, with annotations as to their distribution and abundance.

Just why such an ambitious title as "A Biological Survey of Colorado" should be used for this report is nowhere stated and certainly is not apparent from internal evidence.

If this were the first study of the kind ever made in Colorado it would be a most excellent work. The material here presented, however new to the author, is very little of it new to science. Warren's "Mammals of Colorado," published in 1910, covers the mammals quite fully and numerous publications on ornithology and botany go far beyond the present report in most of the things mentioned in those branches. There are references to various publications on mammals and to one single botanical report, but apparently all the other information given by the author is from his own work. It is little short of marvelous that a young man with so little knowledge of the state, of its climate, its flora and its fauna has been able to prepare so good a report.

The discussion of life zones is conspicuous for that perfect independence of thought characteristic of those who know nothing of the writings and opinions of others. It would seem worth while, before writing about the native animals or plants of a state, to consult the published works of men of science resident in the state. Thus many laughable mistakes might be avoided.

It is a question worth considering whether the writer of "a biological survey" of any state would not do well to visit the museums within the state and make himself known to the naturalists who might help him in his work. The writer of "A Biological Survey of Colorado" according to his own account made his start from Boulder, but apparently did not take the trouble to visit the university there nor the museums in Denver, only 30 miles away.

From a reading of the report under consideration one would imagine that his was the first biological work ever undertaken in the state, save certain previous work on mammals, to which scant reference is made. Even if "a biological survey" means an account of one's own personal experiences in collecting mammals it would seem the part of candor to let the reader know that other men of science have at least looked upon the plants and animals of the region visited.

It is to be hoped that the next time the Bureau of Biological Survey at Washington authorizes the prosecution of "a biological survey" of any state, provision will be made to make the body of the report agree with the title. It would be interesting to know of naturalists generally whether they conceive "biology" to be synonymous with "mammalogy" and also to know whether an account of field trips made by one man is really "a biological survey" of a state.

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PHYSICAL LABORATORY INSTRUCTION

THE article in the December 15 number of SCIENCE, p. 823, by G. W. Stewart on "An Opportunity for the Spirit of Research in Laboratory Instruction in Physics," seems to be a move in the right direction. One aid towards securing this spirit of research is to be found in dispensing with detailed instruction sheets, and with apparatus that is set up and in adjustment. The best way in which to give instructions is in the form of a lecture,

in which the underlying principles are explained, and the object of the experiment is clearly pointed out. In this way a student is permitted to approach the experiment in the same way in which the first person who did it approached it, *i. e.*, as a research problem.

The lecture system necessarily involves the use of some kind of grouping of the experiments. This last, however, is an advantage, as it permits running the laboratory and classroom work parallel to one another.

Another aid with the same object as above, is not to insist too strongly on precise measurements by elementary students. The elementary student is oftened frightened by the task of measuring a thing down to one one-hundredth of one per cent. with a strange piece of apparatus. Only after the student has acquired confidence in himself as an experimenter should great accuracy be insisted upon. However, from the very first the student should express the percentage of error of his observations. By accepting all work at first, with a percentage of error simply indicating poor experimental ability, the student is encouraged to try the experiment. This last also does away with the incentive to "doctor the results." On the other hand, the student dislikes to pass in an experiment with a larger percentage of error than that obtained by the best experimenter in the class, so that he tries his hardest to get a correct result.

The foregoing are simply aids to the spirit of research, the principal thing being the "attitude of the instructor" rather than any particular method.

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The Meetings of Affiliated Societies

To the Editor of Science: I feel like seconding all that Professor Morse has said in a recent (December 22, 1911) number of Science in regard to the custom that has arisen among some of the "affiliated societies," especially the zoologists, of holding the winter-meeting at a different place from that in which the American Association meets.

As I stated before the zoologists at the recent meeting at Princeton, there was a very strong feeling expressed by a number of prominent zoologists at the Washington meeting against the present method of meeting at different places, especially when the meetings are at the same time.

I should like to see a general expression of opinion, through these columns, or otherwise, upon this subject, especially by those zoologists who are members of the American Society of Zoologists. Such an expression of opinion might serve, in some measure, as a guide to the committee that was appointed by the Society of Zoologists to look into the matter.

Albert M. Reese

Quotations

The British Insurance Act

"Buying men's all right—the trouble is they won't stay bought." Such was the reflection of a disillusioned political boss. In the same way it is often easy enough to "do" men. The trouble is they won't stay "done." Mr. Lloyd George is finding that out in the case of the doctors. The members of the medical profession are notoriously bad men of business. They are very busy, and they find it impossible, unlike most other professionals, to divide their lives into water-tight compartments of work and leisure. They are harassed at all hours by calls upon their time and, still more, upon their mental energy. Hence they can attend very little to their professional interests. This fact made them and their leaders an easy prey to so astute and persistent a diplomatist as Mr. Lloyd George. Early in the game he saw that from the point of view of public agitation and public opposition to his measure, it was far more important to conciliate the friendly societies and prevent their rising in revolt than to make concessions to the doctors. Accordingly he "put his money on the societies," and merely put a little chloroform on a handkerchief in the case of the doctors, whispering to them at the same time that it would be all right when they woke up. The suggestion was that they would be

able to make any terms they liked with the local insurance committees when once these were formed. This simple but most successful artifice, and the curious belief entertained by the doctors up to the last moment that Mr. Lloyd George would never dare to pass his bill without having come to a clearer understanding with them that they would work his scheme, prevented the medical profession doing what they might have done, and ought to have done—that is, organize pressure upon members of Parliament and upon the House of Lords in order to prevent the bill passing till their claims had been properly recognized. Now, however, that the bill has actually passed, and the task of putting things right is multiplied a thousandfold in difficulty, the doctors are beginning to wake up and see the terrible position into which they have got themselves, or rather, as the rank and file would say, into which their leaders, inexperienced in political negotiation, have got them. They are at last beginning to understand the very simple rule of strategy—"if you allow yourself to be taken in detail, you are lost." Instead of the doctors being able to make good terms with the individual insurance committees, they are beginning to see that the only chance of their not being bullied into starvation rates by those committees is for the whole profession to hold resolutely together and not to allow themselves to be pounded up piecemeal. At the great meeting at the Queen's Hall on Tuesday night it was obvious that the medical profession is at last seriously alarmed. They realize that they have been "done," but they do not intend to stay "done." Unless we very much mistake the signs of the times, the medical profession mean to organize resistance to the act and to refuse to make any agreements under it, unless and until their just claims are recognized. And here we may interpose that if Mr. Lloyd George offers to negotiate with them, as we fully expect he will, they will, if they are wise, not be content for a second time with promises and general assurances. They must insist that whatever concessions are made shall be embodied in an amending act, to be passed as soon as may be after Parliament reassembles, or, at any rate, before the date at which the measure comes into operation—*i. e.*, July 1 next. They will be told, of course, that such a suggestion is absurd and that nothing can be done till Home Rule is out of the way. "If nothing else forbade it, Mr. Redmond would not," etc. The only answer to this is, "If you can not find time, you can not have our assistance in working your measure."

An even more important sign that the doctors are growing alive to the position of deadly peril in which their interests are placed under the act is to be found in the quasi-referendum which has been organized by a medical newspaper, *The Practitioner*. The journal in question sent out a voting paper to the 29,567 medical practitioners of Great Britain, asking them the following question:

> Are you satisfied that the arrangements made for the profession with regard to the medical service now embodied in the National Insurance Bill would justify you in giving honest and adequate service to the insured?

The result of the poll was most remarkable. 20,712 replies have already been received, with the result that 20,149 doctors have answered "No"—that is, have declared that they are not satisfied that the arrangements of the Insurance act will justify them in giving adequate service to the insured. Only 352 out of the whole 29,000 have expressed themselves as satisfied, while 211 have asked questions—a fact which would seem to indicate that they are not satisfied. Very naturally *The Practitioner* realizes that it is no use to stop at eliciting the dissatisfaction of the profession. Accordingly it has now asked the doctors of Great Britain—Ireland is not affected—or, rather, those who are dissatisfied with the act, to give the following pledge:

> Feeling that the present National Insurance Act is unjust to the medical profession, I hereby pledge my word not to accept any service whatsoever under it. I stipulate, however, that unless at least 23,000 members of my profession in Great Britain combine with me in this pledge, I am to be freed from it.

The pledge is very fairly as well as very ingeniously worded. A doctor whose livelihood depends upon his practise might well shrink from entering upon an obligation which he might find left him isolated. To say, however, that he is willing to run the risks of refusing work under the act if others will stand by him is a very different matter. And here we may remark that the number, 23,000, is not taken at haphazard. It is calculated that at the very least 8,000 doctors will be required to work the insurance scheme. Therefore if 23,000 of the medical men of the country agree to stand together in not working it, the act can not possibly be put into successful operation. The result of *The Practitioner's* second move will, we take it, not be announced before these pages have gone to press, but we shall be very much surprised if the second voting does not correspond with the first. If it does, and some 23,000 doctors are pledged not to take service under the act, the doctors will have done what, in our opinion, the Lords ought to have done: they will have secured a period of delay in which just and reasonable terms can be made with the profession as a whole, and any attempt to take the doctors in detail defeated.

Before we leave the subject we must point out one or two misapprehensions which have arisen, or are likely to arise, in the public mind in regard to the movement. In the first place the public must not suppose that the doctors are threatening to withhold medical advice from the poor or from the sick, the injured or the dying, until they have got their terms. Nothing in the nature of a refusal of their services is threatened or is contemplated by the doctors. They merely say that they will not enter into the special and peculiar contracts which they will be required to make under the act if they are to obtain its so-called benefits. The result will only be that medical attendance on the poor will go on exactly as it is going on at this moment. The poor and the artisans will be looked after by the doctors in the future just as they have been looked after by the doctors in the past and are being looked after now. There is not the slightest ground for the suggestion that the doctors are trying to extort terms by a strike or are doing anything which would disgrace the most humane and the most self-sacrificing of all the professions. As before, they will do what no other profession does: give an immense amount of gratuitous service, not because they like doing work without being paid any more than other men, but because it is their honorable tradition to relieve suffering first and consider the question of payment afterwards—to let the sick and the injured have medical aid gratis or for some derisory remuneration rather than that men and women should suffer when that suffering can be relieved. That noble attitude can, and will, be maintained perfectly well even if the doctors refrain from signing the unfair contracts which will be presented for their signature under the act. The doctors are not proposing to strike or to put an end to any existing contract, but merely to refuse to make new ones which they consider unfair. In truth, the language that has been used about the strike of the doctors, even by the doctors themselves, is chiefly misleading rhetoric. There is no analogy whatever between the action of the medical profession and that of strikers in the great majority of cases. The doctors are not demanding higher fees and better conditions of work than they get at present, but are merely refusing to accept what they are confident will turn out to be lower fees and worse conditions of work.—*The Spectator.*

SCIENTIFIC BOOKS

The Changing Chinese, Oriental and Western Cultures in China. By Edward Alsworth Ross, Ph.D., LL.D., Professor of Sociology in the University of Wisconsin. New York, The Century Co. 1911. 8°. Pp. xvi + 356. Price $2.40, postage 18 cents.

Almost on the day that the great Chinese insurrection broke out, this book emerged from the press. The coincidence is at least fortunate from whatever point of view one sees it. The book is not exactly a prophecy, and it is still too early to speak of the fulfilment of any one's prophecy. But the reader of the book will be put in possession of facts

and information that will greatly aid him in his efforts to account for the events of to-day.

It is well known that Dr. Ross spent many months in 1910 traveling through China. He went for the express purpose of studying the sociology of China, and although the numerous authors of recent books on the celestial empire have usually had a much longer experience in that country than Dr. Ross, still they have not for the most part gone there for a specific purpose, and their accounts are more or less incidental to other objects that called them there. None of them, so far as I am aware, are professional sociologists, and their observations are chiefly centered on political affairs. Of course they treat social matters too, but only from the ordinary standpoint, and not in a systematic and scientific way. Dr. Ross's equipment for observing social phenomena enabled him to see more in a few months than some would see in many years. It also enabled him to interpret facts in the light of a great store of scientific knowledge of human society in general. Whatever he observed he instantly saw the full meaning of, and was thus able to correlate oriental with occidental conditions. The entire history of the western world was at his command, and by this means he could locate China in its proper part of the historic panorama. Instead of considering the Chinese such a strange people as most observers do, because they are unlike ourselves, he simply ran his eye back along the path of European history till he found the epoch at which Europeans were what the Chinese are now. He found it in the middle ages, and he says:

> Not that there is anything queer in the working of the Oriental brain. Not in the least. Their popular thought is unripe, that is all. The bulk of the Chinese match up well with our forefathers between the fourteenth and seventeenth centuries. For in the Middle Ages white men were just as haphazard, casual and uncritical as are the yellow men to-day. They looked for "signs and wonders in the heavens" and trembled at comets. They held that blood-root, on account of its red juice, must be a blood purifier; liverwort, having a liver-shaped leaf, will cure liver disease; eyebright, being marked with a spot like an eye, is good for eye troubles; and so on. They fasted, exorcized demons, burned witches, trusted talismans, paraded sacred images, wore relics of the saints, sought the king's touch to cure scrofula, marched in religious processions to bring change of weather and hung consecrated bells in steeples to ward off lightning. It was the rise of the natural sciences that cleared the fog from the European brain. In the building of astronomy, physics, chemistry and physiology were wrought out certain methods —observation, measurement, trial and error, experiment—which were as helpful for practical life as for science. For a method that connects cause and effect may also light up the relation between effort and result (pp. 315–316).

In some things the Chinese would seem to belong to a still earlier stage in the development of Caucasian peoples, for the absence of chimneys and glass windows carries us back to the first century of our era. They were unknown to antiquity, but were found in the ruins of Pompeii, which was buried in the year 79 A.D. In their apparent ignorance of the value of milk as food the Chinese go all the way back to the Homeric period.

One of the most important points brought out by Dr. Ross, known of course to others, but little emphasized, is the astonishing confirmation that China furnishes of the great "principle of population" of Malthus. Nearly all the woes that China suffers are due directly or indirectly to the operation of this principle, and we may say, secondarily, to its ignorance of it. We thus read:

> For a grinding mass poverty that can not be matched in the Occident there remains but one general cause, namely, *the crowding of population upon the means of subsistence.* Why this people should so behave more than other peoples, why this gifted race should so recklessly multiply as to condemn itself to a sordid struggle for a bare existence can be understood only when one understands the constitution of the Chinese family (p. 96). . . . For adults over-population not only spells privation and drudgery, but it means a life averaging about fifteen years shorter than ours. Small wonder, indeed, for in some places human beings are so thick the earth is literally foul from them. Unwittingly they poison the ground,

they poison the water, they poison the air, they poison the growing crops (p. 104). . . . Here are a people with standards, unquestionably civilized —peaceable, industrious, filial, polite, faithful to their contracts, heedful of the rights of others. Yet their lives are dreary and squalid, for most of their margins have been swept into the hopper for the production of population. Two coarse blue cotton garments clothe them. In summer the children go naked and the men strip to the waist. Thatched mud hut, no chimney, smoke-blackened walls, unglazed windows, rude unpainted stools, a grimy table, a dirt floor where the pig and the fowls dispute for scraps, for bed a mud *kang* with a frazzled mat on it. No woods, grass, nor flowers; no wood floors, carpets, curtains, wall-paper, table-cloths nor ornaments; no books, pictures, newspapers nor musical instruments; no sports nor amusements, few festivals or social gatherings. But everywhere children, naked, sprawling, squirming, crawling, tumbling in the dust—the one possession of which the poorest family has an abundance, and to which other possessions and interests are fanatically sacrificed (pp. 104–105). . . . Utility reigns supreme; and all it comes to is to feed a dirty, sordid, opium-sodden people living in hovels, wearing coarse, faded blue garments, crippling their women by foot-binding, and letting their boys and girls run about filthy and naked! No music, art, books, poetry, worship, refined association, allure of children, charm of women or glory of young manhood in its strength. No discussions, no politics, no heed to events in the great world. Life on a low plane, the prey of petty cares and mean anxieties. Infinite diligence, great cleverness and ingenuity, abundance of foresight and thrift, few destructive passions; still, a life that is dreary and depressing to look upon (p. 287).

Such is the picture. It is this enormous pressure of population that has so reduced the standard of living, and that makes the Chinese people a drove of pigs, rather than a collection of human beings. It is true that they give reasons for it, and that it forms part of their time-honored customs, so that perhaps it may rather be ascribed to error than to ignorance. The result is the same.

The next most striking fact that looms up is the complete improvidence of the Chinese. By this I mean their failure to look forward to the future or to consider the effect of their social system upon coming generations. It may be called social, as distinguished from individual improvidence. Of the latter, as Dr. Ross shows, they are not guilty. But they seem to have no social consciousness whatever. That has been true of other peoples at their stage of culture, but on account of the density of population in China the results have been more disastrous there than elsewhere. The great "Indo-Germanic" migration of which we hear so much, by which central and western Asia were depopulated, was doubtless largely due to the exhaustion of the natural resources by man's reckless individualism, but evidence is accumulating of the gradual drying up of these regions as a planetary process, which may be general all over the world. This, however, appears to have been inappreciable in eastern Asia, and there is still abundant rainfall. The entire Chinese empire is highly favored by nature in this respect, and the destruction that has taken place is exclusively the work of man. It is customary with us to condemn the feudal system and to deplore the reservation of vast tracts of country by a landed gentry, but the condition of China leads us to question whether Europe, but for this, might not have also been denuded and made uninhabitable for civilized man. On this point Dr. Ross aptly remarks:

If the Chinese had not so early rid themselves of feudalism the country might have profited, as did Europe during the Middle Ages, by the harsh forest laws and the vast wooded preserves of a hunting nobility; or a policy of national conservation would have availed if begun five centuries ago. Now, however, nothing will meet the dire need of China but a long scientific, recuperative treatment far more extensive and thoroughgoing than even the most enlightened European governments have attempted. Since that is clearly beyond the foresight and administrative capacity of this generation of Chinese, the slow physical deterioration of the country may be expected to continue during our time (pp. 24, 27).

Dr. Ross gives a brilliant description of the ruined condition of the country, especially on pages 22–24, too extended to be reproduced here, but which should be read by all who are interested in the conservation movement in

the United States. It shows what we would come to if nothing was done. It is also a lesson to the *laissez faire* economists and is a fair sample of the legitimate consequences of the *laissez faire* policy in general.

Another modern economic doctrine is here exemplified, namely, that of historical materialism, as it is called, otherwise named economic materialism, economic determinism, or the economic interpretation of history. I do not refer to the facts, which of course can be relied upon, and we have them here on a grand scale, but to the contention that economic effects are exclusively the result of impersonal, or, as it were, of physical laws, with which men as men, and human ideas have nothing to do. That the entire series of degrading conditions in China is due to the ideas and fixed beliefs of the Chinese is clear almost at a glance. We have seen that their terrible overpopulation is the result of an inveterate conviction of the duty of unlimited propagation, which nothing seems able to shake. The same is true of most of their other calamities, which a sound philosophy might have averted. On this point Dr. Ross says:

> Chinese conservatism, unlike the conservatism of the lower races, is not merely an emotional attitude. It is not inspired chiefly by dread of the unknown, horror of the new, or fanatical attachment to a system of ideas which gives them confidence in the established. It is the logical outcome of precedent. Change the ideas of the Chinese and their policy will change. Let their minds be possessed by a philosophy that makes them doubt the past and have confidence in the future, and they will prove to be as consistently progressive as are the Germans of to-day (pp. 53–54).

It is perfectly clear that the Japanese awakening has been due to a change in their ideas, and when the Chinese similarly change theirs they too will awake and start in a new direction. That the Chinese are not an "inferior" race, that their intellectual capacity is fully equal to that of the Caucasian, nay, of the Aryan race, is clearly brought out in this book, and no one can foresee the results of a development there, should it ever take place, analogous to the intellectual development of Europe since the middle ages.

There are many great subjects treated in this work which space will not permit us more than to mention. One is the condition of women and the prospect of their emancipation. In China, as in India, the androcentric world view is supreme, and its overthrow seems almost hopeless, but progress is being made even here, and foot-binding at least seems destined to disappear. In the relations of the sexes China is certainly medieval if not positively ancient or even barbaric. There is absolutely no mutuality in the choice of partners. None of the three forms of sexual selection to which I gave special names in 1903, viz., gyneclexis, andreclexis and ampheclexis (terms which are defined in the Supplement to the Century Dictionary), can be said to exist in China, but a fourth form, which I did not name, but which may be called *altreclexis*, is universal. This is the selection of wives by third parties —parents, relatives and usually by the house or clan to which the parties belong—and in which neither of the parties to the marriage, least of all the woman, has any voice whatever. Under such a system, which is of course not confined to China, but has widely prevailed in other countries, there can obviously be no romance, and life becomes utterly prosy and uninteresting. But it also shows, as do unnumbered other facts, that there is no psychologic basis in China for a romantic life, that the sentiment underlying it, commonly called romantic love, does not exist in the Chinese constitution, being wanting there as it is in all other races outside of the Caucasian peoples subsequent to the middle ages of European history.

The opium curse of China is treated in an interesting chapter, and the remarkable fact developed is that the crusade against it has been mainly waged by the Chinese themselves. The Christian missionaries residing there, belonging, as they do, to races in which the evil does not exist, have, it is true, cooperated in the movement, but the claim so often made, that they are the chief cause of the progress attained, is utterly unfounded. On the contrary, the strongest resistance that the Chinese

authorities have encountered comes from the British traders, who have taken advantage of the Chinese laws prohibiting the raising of the poppy in China to increase the importation of opium from India. So much for the boasted morality of European nations.

Dr. Ross says nothing of another great moral crusade that the Chinese nation has been long waging, viz., that for the abolition of slavery. For a very full account of that movement we are indebted to Mr. E. T. Williams, who was long Chinese Secretary of the U. S. Legation at Pekin, and was made Consul General at Tientsin in the spring of 1908. Mr. Williams is also a sociologist of no mean order, and is conversant with the entire literature of the science. He treated this subject in the *American Journal of International Law* for October, 1910 (Vol. IV., pp. 794–805; Supplement, Official Documents, pp. 359–373), in an exhaustive article entitled: "Abolition of Slavery in the Chinese Empire." The Supplement contains Mr. Williams's translation of the report of the commission recommending the abolition of slavery and the imperial rescript approving it. The whole is reprinted in pamphlet form.

In all matters relating to the influence of Christianity and Christian missionary work in China our author is decidedly partisan. As an American traveling in China, he was of course largely beholden to American and English missionaries for facilities in getting about, and must have seen a wholly disproportionate part of their influence in the country, and it would have ill become him to speak disparagingly of such things, whatever his real views might have been. But his extravagant praise of them, even where it was deserved, should have been tempered by countervailing considerations which everybody knows to exist. His idea of the ultimate conversion of the Chinese to Christianity is probably Utopian. The hint on page 235 that Christianity might ultimately become the "official religion" of the Chinese empire would be alarming if it rested on any basis of fact. The present humble attitude of the few Christian missionaries in China is no criterion. As Helvetius said: "Christians are lambs when weak, tigers when strong." Christianity is an exclusive religion. It is a militant, proselyting, persecuting religion, in which it differs wholly from Confucianism, Shintoism and Buddhism. If there was any danger that China would have to pass through the ordeal of blood to which Europe has been subjected by Christianity since the middle ages there would surely be grounds for grave apprehension. The Crusades, the Thirty-years War, and the Spanish Inquisition, would be trifles compared to the fanaticism of the whole vast Chinese population, should it ever be seized with the spirit that actuated Europe during six centuries of its unhappy history. If any hope is to be expressed, it should be that there may never be an "official religion" in China, but if there is to be such, let it be one of those tolerant, peaceful and rational forms, that harmonize with all others, permit free discussion and work to the advancement of all moral, material, intellectual and spiritual development.

Of this book, perhaps more than of most others, is the trite remark of the perfunctory reviewer true, that it must be read to be appreciated. The above is not a review of it, but merely a brief mention of a few of the most vital points contained in it. The book is a study in sociology by a leading sociologist, based on direct personal observation, of the numerically greatest people on the globe.

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Natural History of the American Lobster. By Francis Hobart Herrick, Ph.D., Sc.D. Document No. 747, from the Bulletin of the Bureau of Fisheries, Vol. 29, 1911. Government Printing Office, Washington, D. C.

There is surely no one acquainted with Professor Herrick's earlier monograph[1] on the lobster, who does not heartily welcome his recent book, "Natural History of the American Lobster."

[1] "The American Lobster: A Study of its Habits and Development," *U. S. Fish Commission Bulletin*, Vol. 15, pp. 1–252.

Herrick's monograph of 1895 was an excellent assemblage of original data, bearing chiefly upon the anatomy and development—but to a very slight extent upon the habits—of our most far-famed decapod. The paper was adequately illustrated with original drawings and was accompanied by a bibliography of 213 titles. This was a book which merited a place upon the shelves of every zoologist and student of natural history—a place beside Professor Verrill's "Invertebrates of Vineyard Sound."

At the time of this earlier work, the lobster's main interest for the zoologist lay in the fact that it was an easily obtained "type-specimen"; gastronomically it was well known and appreciated, and the term, lobster, in the discussion of lobster laws, might sometimes have been heard in the halls of legislatures; that was about all. During the last fifteen years, circumstances have changed greatly. This species now finds itself at the focus of several zoological interests, and in legislative assemblies many word-battles have been fought in efforts to do equal justice to the lobster, on the one hand, and to the great American public on the other. The lobster fisheries of the country have become recognized as never before, as a point of great economic importance. The spirit of conservation, coupled with biological incentive, has rendered important the consideration of artificial propagation of marine fauna—a movement in which the propagation of the lobster has been foremost. But in addition to all this, the lobster has become possessed of more subjective interests. Important and instructive as has proved its developmental history, it has become a means of attack upon larger problems. As a subject for the study of regeneration and problems in morphogenesis, the lobster has supplied valuable material; and metamorphic transitions in cellular and tissue elements have been more clearly revealed through histological researches upon this invertebrate. Moreover, the student of animal behavior, a branch of study which, at the time of Herrick's earlier report, had scarcely emerged from the general field of natural history, has found in this crustacean a subject of value with reference to the investigation of problems in comparative psychology, instinct and habit-formation in lower animals. Both in this country and in Europe, many eyes have been turned upon *Homarus* and during the past six or eight years, alone, several important contributions based upon the study of this crustacean have been made. Indeed, as Herrick states, there is probably at the present time no invertebrate in the world better known than the American lobster.

Such a growing interest in *Homarus* can readily explain why it is that in Herrick's new publication we find 408 pages as compared with 252 in his earlier report; and why the bibliography has expanded from 213 to 329 titles. But this increased outside interest in the lobster does not account entirely for the greater proportions of the present work, since the author himself, through his continued studies, has added much, both in the text and in valuable illustrative features.

The subject matter of the book is presented in twelve chapters, which have the following headings: (1) The Lobsters and Allied Crustacea; their Zoological Relations, Habits, Development and Use as Food; (2) The American Lobster; its Economic Importance and General Habits; (3) Giant Lobsters; (4) Molting; (5) Enemies of the Lobster; (6) The Anatomy of the Lobster, with Embryological and Physiological Notes; (7) The Great Forceps, or Big Claws; (8) Defensive Mutilation and Regeneration; (9) Reproduction; (10) Development; (11) Behavior and Rate of Growth; (12) The Preservation and Propagation of the Lobster.

The text of these chapters has been practically rewritten and many valuable additions have been made. These additions relate to chapter I., with its section on the "natural history of the Crustacea," to chapter VI., with the much more complete references to the internal anatomy, especially of the nervous system and its connections; to chapter VII., with its added sections discussing symmetry, asymmetry and torsion, data largely supplied by Herrick's recent investigations;

to chapter VIII., with fundamental additions to our knowledge of the regenerative process, and embodying the excellent work of Emmel; to chapter XI., bringing in an almost new section concerning the behavior of the lobster; and, finally, to chapter XII. (and also to part of chapter I.) discussing the economic importance of the lobster fisheries in this country and considering means of preservation and propagation.

In this last chapter, Herrick frankly considers the question, "What is the matter with the lobster?" and discusses very fully the pros and cons of all methods, legislative and otherwise, suggested for its protection. "Unfortunately for many years," says the author, "we have watched this race decline until some have even thought that commercial extinction, and that not far remote, awaited the fishery. . . . If this is primarily a scientific question, the zoological history of the animal should give us the answer. . . . The main biological facts . . . are now well in hand, and excuse can no longer be offered on the ground of ignorance."

After showing by means of convincing statistics the fact of the decline in the lobster fishery in this country, Herrick considers the cause.

> More lobsters have been taken from the sea than Nature has been able to replace by the slow process of reproduction and growth. In other words, man has been continually gathering in the wild crop, but has bestowed no effective care upon the seed. The demands of a continent steadily increasing in wealth and in population have stimulated the efforts of dealers and fishermen, who must work harder each year for what they receive in order to keep up the waning supply. The natural result has followed, namely, a scarcity of numbers and a decrease in the size of the animals caught, with steadily advancing prices paid for the product. This is precisely what we should expect, had we based our judgment upon any sound principles of common sense and human economy, not to speak of a knowledge of the mode of life and general natural history of the animal in question.

Herrick shows that all measures which have heretofore been adopted in this country to check the decline have failed, and it can be concluded that "either the laws are defective or the means of enforcing them are insufficient." Since a *closed season* for any animal, to have protective value, must correspond with the breeding season, and since this is impossible in the case of the female lobster (which spawns only once in two years and carries its eggs externally for about a year), closed seasons are not recommended as a possible means of improving conditions.

Moreover, legislation calculated to protect the "berried" lobsters has not been successful, because many fishermen evade the law by combing the eggs from the abdomen of the female. In addition, Herrick clearly points out that, even if an egg-lobster law could be enforced, the protection aimed at must necessarily be reduced by one half, since the adult females lay eggs but once in two years, and therefore, at any given time only one half of them would be "in berry." The plan sometimes followed, of enclosing the "berried" females in crates and allowing the eggs to hatch naturally, Herrick thinks commendable, but inadequate for the preservation of the fishery.

As to the gauge law, while admitting that it has scarcely ever been thoroughly enforced in any locality, Herrick also believes this to be inadequate, whether short lobsters are destroyed or not.

> First, by legalizing the capture of the large adult animals, above 10½ inches in length, we have destroyed the chief egg-producers, upon which the race in this animal, as in every other, must depend. Second, as supporting or contributory causes, some of us now, like others in the past, have entertained false ideas upon the biology of this animal, especially (*a*) upon the value of the eggs or their rate of survival, that is, the ratio between the eggs and the adults which come from them, and (*b*) of the true significance to the fisheries of the breeding habits, especially in regard to time and frequency of spawning and the fosterage or carriage of the eggs. Our practises have been neither logical nor consistent, for, while we have overestimated the amount of gold in the egg, we have killed the "goose" which lays it. We have thought the eggs so valuable that we have been to great

trouble and expense in collecting and afterwards hatching them and committing the young to the mercy of the sea, while we have legalized the destruction of the great source of the eggs themselves—the large producing females.

And again Herrick states:

This race needs eggs, not by the tens of thousands merely, but by the tens of billions, and it must have them or perish. Moreover, it can get them only, or mainly, through the big producers, the destruction of which the present gauge laws have legalized. If the lobster is a good incubator, the sea is a very poor nursery.

Thus Herrick brands as thoroughly ineffective any gauge law which protects the female lobster merely to the 9, 10 or 10½ inch limit. This limit enables them to lay, in all probability, but a single lot of eggs, usually not more than 10,000, and, according to Herrick's estimate, only one lobster out of 15,000 eggs reaches maturity.

Analyzed in the light of the law of survival (one out of 15,000 eggs), Herrick does not look upon the showing of the lobster hatcheries as very encouraging, since, to hold the lobster fishery at an equilibrium would require the hatching of larvæ by the trillions; we can not work on such a scale. In the method of rearing the young through the critical or larval period, as practised at the Wickford Experiment Station of the Rhode Island Commission of Inland Fisheries, Herrick, however, sees great possibilities of material aid to the lobster fishery.

The chapter on Preservation and Propagation concludes with a set of five recommendations devised to protect the lobster fishery. These are worth presenting in full:

1. Adopt a double gauge or length limit, placing in a perpetual close season or protected class all below and all above these limits. Place the legal bar so as to embrace the average period of sexual maturity, and thus to include what we have called the intermediate class of adolescents, or smaller adults. These limits should be approximately 9 inches and 11 inches, inclusive, thus legalizing the destruction of lobsters from 9 to 11 inches long only when measured alive. In this way we protect the young as well as the larger adults, upon which we depend for a continuous supply of eggs. The precise terms of these limits are not so vital, provided we preserve the principle of protecting the larger adults.

2. Protect the "berried" lobster on principle, and pay a bounty for it, as is now done, whether the law is evaded or not, and use its eggs for constructive work, or for experimental purposes with such work in view.

3. Abolish the closed season if it still exists; let the fishing extend throughout the year.

4. Wherever possible, adopt the plan of rearing the young to the bottom-seeking stage before liberation, or cooperate with the United States Bureau of Fisheries or with sister states to this end.

5. License every lobster fisherman, and adopt a standard trap or pot which shall work automatically, so far as possible in favor of the double gauge, the entrance rings being of such a diameter as to exclude all lobsters above the gauge, and the slats of the trap of such a distance apart as to permit the undersized animals to escape.

If the double gauge should prove ineffectual because of not being uniformly adopted or rigidly enforced, Herrick recommends the following steps with reference to the maintenance of the present laws:

1. Raise the legal gauge to 10½ inches wherever it now stands below this limit.

2. License every lobster fisherman, and adopt a standard trap, with slats of sufficient distance apart to permit the undersized lobsters to escape.

3. Destroy the enormously destructive interstate commerce in short lobsters.

4. Do not turn another larval lobster into the sea, but devote the energy expended in lobster hatcheries to rearing these young to the bottom-seeking stage after the methods now successfully practised at Wickford, R. I.

To conclude, it may be said that this volume on the American lobster is written in a clear and fascinating style, by virtue of which it will find approval in the hands of many classes of readers. To the scientifically minded it will be a mine of information, exact, well-classified and marvelously complete; to the ordinary reader it will prove an entertaining essay and study in natural history, while to those especially interested in the preservation and propagation of the lobster, it should serve as a trustworthy guide

for adequate legislation and for effective control of the lobster fishery.

Philip B. Hadley

Kingston, R. I.

Farmers of Forty Centuries, or Permanent Agriculture in China, Korea and Japan. By F. H. King, D.Sc. Published by Mrs. F. H. King, Madison, Wis. 8vo. Pp. 441, 248 illustrations. 1911.

A more wholesome work at the present stage in agricultural agitation in this country could scarcely be written; nor could it well come from one better fitted to write it, for the tenor of the story falls closely into line with Professor King's intensive studies on soil management. In a very peculiar sense the art of soil management in distinction from soil science constitutes the theme of this work. Until recently, the Chinese, Japanese and Koreans were almost wholly without formal agricultural science in the western technical sense, while they have for centuries been adepts of unsurpassed skill in agricultural practise. The story of Professor King is not the less weighty because he has seemed to lean a little at times to the tide of Occidental opinion that has set rather strongly heretofore toward chemical analysis as the decisive mode of attack and source of guidance, and he can not be thought partial in setting forth the attainments of Oriental peoples who have worked in almost entire negligence of all resources but those of the farm, the home and the town. "Farmers of Forty Centuries" is in effect a sketch of domestic methods of nursing crops.

As Dr. Bailey intimates in a graceful preface to the book, Dr. King has played well the rare part of "an *agricultural* traveler" and his results are quite on the high level of those other traveling experts who set forth natural features or social phenomena with expert touch. Professor King crossed Japan and touched eastern China on his inward trip, but his serious work only commenced when he reached the tropical border of south China and began to work northward with the advancing season. This put him in the way of critically following the modes of treatment in vogue just at the transition from the winter crops to the spring and early summer crops. These combined at once the maturing and the harvesting of the one and the fitting, the planting and the early culture of the other. Thus he advanced by stages—looping back for restudy midway—from the tropical border in Kwangtung and Kwangsi, into Chekiang and Kiangsu in the latitude of our southern states, later into Shantung and Chili in latitudes comparable to Kentucky and Illinois, and at length into Manchuria, whose climate is comparable to that of our distinctly northern states. Passing through Korea, he was guided in a further study of Japan by details from the Japanese agricultural stations in which western science has already joined hands with Oriental experience with the happiest results.

King's treatment is everywhere sympathetic and appreciative. He is singularly free from the Occidental provincialisms that mar so many stories of Oriental travel. He seems to have carried at all times the trained sense of the agriculturalist and of the student of fertilization, not the sniffing nose of the typical westerner. He seems in no wise to have been squeamish about inevitable organic odors, but yet was keen enough to note the singular scarcity of flies and to draw the inference that it meant a vital order of cleanliness and carried a sanitary significance. In the universal use of hot tea-tinctured drinks he saw as other incisive travelers have done an important protective custom. Nowhere does he lapse into grewsome pictures of putative decimations due to invited diseases. His tale is that of a fair-minded friendly visitor seeking to learn, and his story is in grateful contrast to the irksome animadversions of the commonplace Occidental writer who plumes himself on looking down on Oriental customs "e superiore loco," as Cæsar would say.

King's statements are larded with quantitative data and carry a wealth of precise fact brought close home to the special cases of individual farmers or particular practises. The smallness of the farms, the largeness of the product, the lavishness of the labor and a multitude of special items relative to specific

crops, modes of handling, costs of fertilization, and largeness of population per unit area, make the book a thesaurus of its kind.

The author, like the reviewer whose educational studies in China ran contemporaneously with these agricultural ones, was impressed with the extent of resources still unused in the very regions whose overcrowded condition has been so common a theme of lugubrious comment. Scattered through the volume there are economic points of the most vital pith that should serve as an antidote to the pessimistic Jeremiads so current in these days and so commonly floating on very shallow waters. The following quotation from the final chapter on Japan, p. 425, must suffice to indicate the tenor of the author's outlook on future possibilities:

> In 1907 there were in the [Japanese] Empire some 5,814,362 households of farmers tilling 15,201,969 acres and feeding 3,522,877 additional households, or 51,742,398 people. This is an average of 3.4 people to the acre of cultivated land, each farmer's household tilling an average of 2.6 acres.
>
> The lands yet to be reclaimed are being put under cultivation rapidly, the amount improved in 1907 being 64,448 acres. If the new lands to be reclaimed can be made as productive as those now in use there should be opportunity for an increase in population to the extent of about 35,000,000 without changing the present ratio of 3.4 people to the acre of cultivated land.
>
> While the remaining lands to be reclaimed are not as inherently productive as those now in use, improvements in management will more than compensate for this, and the Empire is certain to quite double its present maintenance capacity and provide for at least a hundred million people with many more comforts of home and more satisfaction for the common people than they now enjoy.

The soul of the book lies in its appreciative delineation of methods that have sufficed for the maintenance through many centuries of perhaps the highest average productivity ever attained by great peoples, and its chief lesson lies in the realization of this by simple domestic means. The style of the book is excellent and the two hundred and forty odd half tones effectively illustrate the text.

That this should be the last contribution of one who has written so much and so well is a source of inexpressible regret.

T. C. CHAMBERLIN

SCIENTIFIC JOURNALS AND ARTICLES

THE closing (October) number of volume 12 of the *Transactions of the American Mathematical Society* contains the following papers:

W. A. Manning: "On the limit of the degree of primitive groups."

G. A. Miller: "Isomorphisms of a group whose order is a power of a prime."

John Eiesland: "On minimal lines and congruences in four-dimensional space."

G. C. Evans: "Volterra's integral equation of the second kind, with discontinuous kernel. Second paper."

E. J. Wilczynski: "One-parameter families and nets of plane curves."

Also: "Notes and errata, volumes 10 and 11."

THE December number (volume 18, number 3) of the *Bulletin of the American Mathematical Society* contains: "A generalization of Lindelöf's theorems on the catenary," by Oskar Bolza; "A note on the theory of summable integrals," by S. Chapman; "Irreducible homogeneous linear groups of order p^m and degree p or p^2," by W. B. Fite; Report on "Graduate work in mathematics in universities and in other institutions of like grade in the United States," by the American committee of the International Commission on the Teaching of Mathematics; "Shorter Notices": Holton's Shop Mathematics, by C. N. Haskins; Timerding's Die Mathematik in den physikalischen Lehrbüchern, and Siddons and Vassall's Practical Measurements, by E. W. Ponzer; Hosmer's Azimuth, by E. B. Wilson; "Eisenhart's Differential Geometry," by G. A. Bliss; "Note on collineation groups," by H. H. Mitchell; "Notes"; "New Publications."

THE January number of the *Bulletin* contains: Report of the October meeting of the society, by F. N. Cole; Report of the October meeting of the San Francisco Section, by T. M. Putnam; "The Carlsruhe meeting of the German Mathematical Society," by Virgil Snyder;

"A new proof of the existence theorem for implicit functions," by G. A. Bliss; "On a set of kernels whose determinants form a Sturmian sequence," by H. Bateman; "On the cubes of determinants of the second, third and higher orders," by R. E. Moritz; "Note on the maximal cyclic subgroups of a group of order p^m," by G. A. Miller; "An expression for the general term of a recurring series," by Tsuruichi Hayashi; "Shorter Notices": Lebon's Biographie et Bibliographie of Emile Picard and Paul Appell, by J. W. Young; Vermeintliche Beweise des Fermatschen Satzes, from the *Archiv der Mathematik und Physik*, and Lind's Ueber das letzte Fermatsche Theorem, by Joseph Lipke; Slaught and Lennes's Solid Geometry, by F. W. Owens, Hawkes, Luby and Touton's First Course in Algebra, by J. V. McKelvey; "Corrections"; "Notes"; "New Publications."

WHEAT RUSTS AND SUNSPOTS

In looking over a copy of the *Journal of the Agri-Horticultural Society of Western India* for April to June, 1906, I was interested to notice, on page 165, an article with the above caption, by G. N. Sahasrabudhe, of the College of Agriculture at Poona. The author refers to a report in the *Proceedings* of the Australian Wheat Conferences of periodicity in the occurrence of *Puccinia graminis* in Australia. The years of the most severe attacks, it is stated, were 1867, 1878 and 1889, making a period of eleven years between every two maximum years. The writer goes on to state that this cycle suggested to some members of the conference that it had some relation with the various phases through which the fungus has to go, but quotes from Surgeon-Major D. Prain the statement that "the periodicity is not due to any inherent property of the fungus, but must, as seems to be the belief in Chili, be due to the recurrence of conditions favorable for its development."[1] I quote the following paragraph entire:

> We have trustworthy records of rust attacks in Australia from 1867. In that year it was almost general and caused immense loss in South Australia. This is the minimum year of the sun-spot cycle (1867–78). The year 1878 was one of the worst years for rust in Victoria, and in South Australia it prevailed over a large area that year; that also was the minimum year of the sun-spot cycle. In South Australia 1880 was the year when a considerable area was affected; and it was the year when the sun-spot area was very small. The seasons 1882–1888 seem to have been very free from rust; and that was the maximum period of the sun-spot cycle (1879–1889). In 1889 it was almost general and caused great loss in South Australia, Victoria, New South Wales and Tasmania; and that was the minimum year of the sun-spots. This clearly proves that the attack of the pest is most severe when the sun-spot area is the smallest, and from the theory of the sun-spots it does not seem unnatural. It is well known that the changes in sun-spots are closely related to the changes in the atmospheric pressure and consequently in the rainfall; and experience shows that the development of the fungus is dependent to a great extent on the atmospheric conditions and rainfall. The opinions of the farmers put forward in the Second and Third Conferences indicate the same thing. Rust is usually most prevalent in seasons when the rainfall is excessive, especially during October and November.[2] When close, damp, muggy weather sets in, the rust is certain to appear (indicating diminution in pressure). A dry cold season in Queensland is inimical to rust. The year 1889, which was a very rusty one, was marked in New South Wales by frequent thunderstorms at the time the wheat was in bloom. The colder districts were in that year less rusty than others.

The author states that when he thought the matter over, especially the remark by Dr. Prain, he thought there must be some relation between this eleven-year cycle and the Brookner's cycle of sunspots, which is also of eleven years, and that when he began to compare the two cycles closely, he was "almost convinced" that there must be some relation between sunspots and the growth of the *Puccinia* fungus. This relationship, he concludes, may "throw a great light on the life history of the fungus and also we may be able to foretell the years in which the rust attacks will

[1] Agri. Ledger, No. 16 of 1897, p. 9.

[2] Proc. of II. Con., 17, 49.

be severe from the observation of the sun-spots."

A hasty survey of the literature concerning the occurrence of *Puccinia*, and brief correspondence or personal conferences with some of our American botanists failed to reveal any knowledge of this hypothesis, and although it is not probable that it is of any great importance, I thought it would be of sufficient interest to be placed on record in an American publication.

C. STUART GAGER

BROOKLYN BOTANIC GARDEN

SPECIAL ARTICLES

TIER-LIKE ARRANGEMENT OF THE ELEMENTS OF CERTAIN WOODS

THERE are numerous woods which present on longitudinal section (particularly the tangential) fine, delicate cross lines or stripes sometimes called "ripple marks." The distance between these markings varies from 0.11 to 0.50 mm., and is fairly constant for a species. On some woods (*e. g.*, *Æsculus octandra* Marsh., *Swietenia mahagoni* Jacq., *Bombax insigne* Wall. and *Pterospermum diversifolium* Blume.) these lines are very clear and distinct to the unaided eye; on others (*e. g.*, *Tilia americana* L., *T. pubescens* Ait., *Pterocarpus indicus* Willd. and *P. dalbergioides* Roxb.) they are near the limit of vision or again (*e. g.*, *Guaiacum sanctum* L. and *G. officinale* L.) they are invisible without the lens. In most species showing these markings the feature is constant and of considerable importance for diagnostic purposes, though in a few species (*e. g.*, *Swietenia mahagoni*) the same piece of wood may show the markings in one place and not in another.

This cross-striping of a wood is due (1) to the arrangement of the rays in horizontal series, or (2) to the tier-like ranking of the wood fibers, vessel segments or other elements, or (3) to a combination of (1) and (2). The lines resulting from the horizontal seriation of the rays is usually more conspicuous and of more common occurrence than those in (2). In the combination of the two forms, which is very common, the junction of the vessel segments or of the fibers is usually between the rays.

This peculiar arrangement of wood elements is also evidenced on transverse section. Where the rays are in perfect horizontal seriation a section between two tiers shows an entire absence of rays. In most instances, however, it results in gaps of irregular width depending upon the regularity of the stories. Where the rays are much wider near the middle than at the margin their apparent width when viewed transversely will show considerable variation, according to the relative location of the plane of section. Where the fibers are arranged in tiers their apparent size is affected in a similar manner. According to von Höhnel[1] the fibers in *Bocoa provacensis* Aubl., and a few other tropical woods with cross-striping are also radially disposed, and when the plane of cutting passes near the junction of two tiers the section shows large and small cells in alternate radial rows. The small cells are sections of the tips of the fibers forced by growth between their upper and lower neighbors. It is von Höhnel's theory that their appearance in alternate radial rows instead of alternately in the same row is the result of the pressure of the bark upon the cambium while the fibers were being formed.

Tier-like arrangement is most common in tropical woods and has been found fairly characteristic of the families Cæsalpiniaceæ and Zygophyllaceæ. Various writers[2] have

[1] Von Höhnel, Franz Ritter, "Ueber stockwerkartig aufgebaute Holzkörper," *Sitzungsberichte der Mathematische-Naturwissenschaftlichen Classe der kaiserlichen Akademie der Wissenschaften*, Vol. 89, Part 1, Wien, 1884, pp. 30–47. Von Höhnel, Franz Ritter, "Ueber den etagenformigen Aufbau einiger Holzkörper," *Berichte der Deutschen Botanischen Gesellschaft*, Vol. II., Berlin, 1884, pp. 2–5.

[2] Flückinger, J. A., "Pharmacognosie der Pflanzen," 2d ed., pp. 463, 466. Wigand, A., "Anatomische Atlas zur pharmaceutischem Werkende," 1865, tables 26, 27. Whitford, H. N., "The Forests of the Philippines," Bul. 10, Bureau of Forestry, Manila, P. I., 1911, Vol. II., p. 36.

called attention to this feature which is especially striking on red sanders (*Pterocarpus santalinus* L. f.), narra (*P. indicus* Willd.), and Jamaica quassia (*Picrasma excelsa* Planch.). Von Höhnel (*loc. cit.*) observed it in about 80 different woods, all tropical or sub-tropical but one (*Diospyros virginiana* L.), and most of them unidentified. His list of the identified woods includes 35 genera of 12 families, viz., Cæsalpiniaceæ, Papilionaceæ, Mimosaceæ, Zygophyllaceæ, Büttnereaceæ, Malvaceæ, Cedrelaceæ, Bignoniaceæ, Simarubaceæ, Ebenaceæ, Rosaceæ and Sapindaceæ.

Included in v. Höhnel's list are two species which occur in the United States, viz., *Swietenia mahagoni* and *Diospyros virginiana*. In addition to these two the present writer has observed tier-like arrangement in the woods of *Æsculus octandra, Tilia americana, T. pubescens, T. heterophylla* Vent. and *Guaiacum sanctum*.

ÆSCULUS (BUCKEYE)

In the wood of *Æsculus octandra* the rays are fine, uniseriate, uniform, inconspicuous, mostly 10–12 cells high, measuring about 0.25 mm. The average distance between the rays is, vertically, 0.15 m.; laterally, 0.06 mm. Their arrangement is in horizontal series, very regular on the radial section but forming somewhat wavy lines on the tangential, though always plainly visible to the unaided eye. The vessel segments are from 0.35 to 0.40 mm. long and are in series, the horizontal planes of their perforations alternating with the rays. The fibers appear not to be in storied arrangement.

The cross-markings on tangential surface are characteristic of *A. octandra* and were not observed in *A. glabra* Willd., *A. californica* Nutt. or *A. hippocastanum L.*, though all three show indistinctly on radial surface a tier-like arrangement of the wood elements. This feature is thus important in separating the wood of *A. octandra* from others of the genus.

TILIA (BASSWOOD)

Tier-like arrangement of the wood elements is characteristic of the woods of *Tilia americana, T. pubescens* and *T. heterophylla*. The ending of the vessel segments, wood fibers and wood parenchyma fibers is quite uniform. The rays are widely variable in size and are irregularly spaced. The small rays are uniseriate and mostly 10–15 cells high; the largest are 3–5 cells wide and 50–100 cells high. The cells are small and much flattened laterally.

The cross-markings of *Tilia* are not conspicuous, but in proper light are usually readily visible to the unaided eye. The average height of the tiers is about 0.40 mm.

SWIETENIA (MAHOGANY)

Tier-like arrangement is often characteristic of the true mahogany (*Swietenia mahagoni*). While it may be absent, it is quite often very conspicuous. When present the tiers vary in height from 0.35 to 0.50 mm. The rays are deep crimson in color, fusiform, and quite irregular in size; 1–5, mostly 2 or 3, cells wide, and 4–20, mostly 10–15, cells high. When the rays are in storied arrangement they coincide with the vessel segments.

Swietenia senegalensis Deso. is said by von Höhnel (*loc. cit.*) to be without cross-striping.

DIOSPYROS (PERSIMMON)

In *Diospyros virginiana* the rays are very numerous, composed of large cells in 1–2 (rarely 3) rows, and from 2–14, usually 10–12, cells high. They are arranged in horizontal series which correspond with the vessel segments, wood fibers and wood-parenchyma fibers. The arrangement is often somewhat irregular and is never conspicuous, though clearly visible to the unaided eye. The height of the tiers is about 0.35 mm. The horizontal seriation of the rays appears to have been first described by Molisch.[3]

Available specimens of the wood of *D. texana* Sch. do not exhibit the cross-markings.

[3] Molisch, H., "Vergleichende Anatomie des Holzes der Ebenaceen und ihrer Verwandten," *Sitzungsberichte der Mathematische-Naturwissenschaftlichen Classe der kaiserlichen Akademie der Wissenschaft*, Vol. 80, Part I., Wien, 1879.

GUAIACUM (LIGNUM-VITÆ)

The wood of *Guaiacum sanctum* exhibits very fine and quite uniform cross-markings, visible with the aid of the lens. The rays are very fine, uniseriate, mostly 5–7 cells high, deeply colored, appearing under lens like fine hachures. The height of the tiers varies from 0.15 to 0.18 mm. The scattered vessels are filled with a dark-colored resin which adds to their prominence. The vessel segments alternate with the rays.

Guaiacum officinale L. is similar to *G. sanctum* in the arrangement of the wood elements. The distance between markings is often as low as 0.11 mm. The rays are about 0.05 mm. apart laterally and 90 μ vertically.

In addition to those mentioned above, the writer has observed many tropical woods (particularly African and Brazilian) with tier-like arrangement of their elements.

SAMUEL J. RECORD

YALE FOREST SCHOOL

A SCLEROTINIA ON APPLE

PRIOR to 1902 the fungus causing the brown rot of fruit, both drupaceous and pomaceous, was, at least in this country, commonly referred to *Monilia fructigena.* Norton[1] observed the perfect stage of the fungus on peach, and called it *Sclerotinia fructigena* (Persoon) Schroeter. Coincident with Norton's work on the *Sclerotinia,* Aderhold,[2] of Germany, was making a study of some forms of this genus and was able to secure a perfect stage of a *Monilia* on apple. He has published good evidence that the form of *Sclerotinia* he found on apples was *Sclerotinia fructigena* (Persoon) Schroeter, and that the form Norton found on peach was *Sclerotinia cinerea* (Bon.) Schroeter instead of *S. fructigena,* although this name has not since been taken up by American authors.

Aderhold was the first investigator to report the perfect stage of *Monilia* or brown rot fungus on apple, and it has not, so far as I know, been reported since.

I have recently (November, 1911) obtained apothecia of *Sclerotinia* upon mummied apples, which were strikingly different in some respects from those described by Aderhold. These were produced by placing mummied apples in a greenhouse during April, 1911. The mummied fruits were lying upon the surface of the soil and were of course subjected to alternate wetting and drying. During the following summer the greenhouse was neglected and the mummies became very dry, which may to some extent account for the growth of the apothecia later on during the season. The sclerotia remained apparently dormant until a light heat was applied in the building during November. They were first observed by me November 13, 1911. The temperature in the greenhouse at this time was very similar to that of spring conditions, which, I think, was mainly responsible for the growth of the apothecia.

When collecting these decayed fruits only those were selected that were thought to have been grown two seasons previously. Of a dozen or more mummies placed in the greenhouse, all disappeared during the summer but eight; of these eight, five produced forty-one apothecia.

The apothecia arose from the characteristic sclerotia of this genus. The cups varied in size from one to four mm. across. When young they were decidedly campanulate, then flattening to a disk and later becoming cup-shaped again. In color they varied from a cinnamon-brown to gray, when mature.

The mummies were all lying upon the surface of the soil, therefore there was no necessity for a long growth of stipe. Its length ranged on the average from 1 to 2.5 mm. One stipe made a growth of one half centimeter.

In general, the parts of the apothecia are very similar to those growing upon peach, and also to those described by Aderhold as growing upon apple. The most striking dissimilarity is in size, the new form being much smaller.

The asci measure 44 to 64 microns long and

[1] *Trans. Acad. Sci. St. Louis,* Vol. 12, p. 91, 1902.

[2] *Ber. Deutsch. Bot. Land. Ges.,* Vol. 22, p. 267, 1904. Aderhold and Ruhland, *Arbeit. Biol. Abt. Lamd. Forst. Gesandh.,* Vol. 4, p. 29, 1905.

4 to 6 microns wide. The spores are oblong, somewhat pointed at both ends, 6 to 8 microns long and 2 to 3 microns wide. The paraphyses which are very numerous and which vary somewhat from filiform to clavate, are 40 to 60 microns long and 1 to 3 microns wide.

TABLE GIVING THE COMPARATIVE MEASUREMENTS OF THE PEACH AND APPLE SCLEROTINIAS

	Asci	Asco-spores	Para-physes	Apothe-cia	Stipe
Peach	89.3–10.26μ by 5.9–6.8μ	6.2–9.3μ by 3.1–4.6μ			3–5 cm. long
Apple (Demarree)	44–64μ by 6–8μ	6–8μ by 2–3μ	40–60μ by 1–3μ	1–4 mm. across	1–5 cm. long
Apple (Aderhold)	120–180μ by 9–12μ	11–12.5μ by 5 6–6.8μ	175–180μ by 2–5μ	1 mm. across	.5–15cm. long

The above table shows very plainly the dissimilarity of the forms found by Aderhold and those found here. In every respect the different parts of the *Sclerotinia* are smaller than those described by the German investigator.

It is to be regretted that I was unable to produce any growth from the ascospores, though they were tried in various cultures, including fruit and cooked apples; therefore there is no proof of any connection with a conidial form of *Sclerotinia*. But it seems evident that this is a new *Sclerotinia*, although it may be, and it is my supposition that it is, the perfect form of the fungus causing the brown rot of apples in this country. It may, however, be the perfect stage of *Monilia uredoformis* Ellis & Everhart[1] which has been reported as growing upon apples. If so *Monilia uredoformis* Ell. & Ever. would be referred to *Sclerotinia* as *Sclerotinia uredoformis*, although it is very obvious that this can not be done until *Monilia* spores can be produced from the new form. The investigation of this *Sclerotinia* will be continued and I hope to be able to report something more definite later.

J. B. Demaree
Maryland Agricultural College,
College Park, Maryland

[1] *Proceed. Acad. N. Sc. Phil.*, 1893, p. 461.

THE AMERICAN SOCIETY OF NATURALISTS

The twenty-ninth annual meeting of the American Society of Naturalists was held in Guyot Hall of Princeton University on December 28.

The eastern and central branches of the American Society of Zoologists so arranged their program that members were enabled to attend the Naturalists' meeting. Many members of the Association of Anatomists, which also met at Princeton, attended the program. Although the Botanical Society met elsewhere, a number of botanists were present. It may fairly be said, judging from the attendance of the sessions, that the Naturalists' Symposium was the central feature of the entire Princeton meetings.

The Anatomists, Zoologists and Naturalists had a joint smoker at the Princeton Inn on Wednesday evening.

The Naturalists' dinner was given on Thursday evening at the Princeton Inn. More than one hundred persons were present, this being the largest attendance for a number of years. After the dinner the president, Professor H. S. Jennings, delivered his address on "Heredity and Personality." This splendid address was most enthusiastically received and has been published in the December 29th number of Science.

The scientific program of the meeting was given on Thursday, both forenoon and afternoon.

The forenoon meeting was devoted to a discussion of "The Relation of the Experimental Study of Genetics to the Problems of Evolution." The following papers were presented:

E. G. Conklin (Princeton University): The Problems of Evolution and the Ways they may be best Attacked.

C. B. Davenport (Carnegie Institution): Light thrown by the Experimental Study of Heredity upon the Factors and Methods of Evolution.

W. Johannsen (University of Copenhagen): Modern Exact Genetics in relation to the Problems of Evolution.

H. F. Osborn (American Museum of Natural History): Unit Characters, Continuity and Discontinuity, as observed by the Paleontologist.

H. L. Clark (Museum of Comparative Zoology, Harvard University): Pure Lines and Phylogeny.

At the afternoon session papers on Genetics were read as follows:

B. M. Davis (University of Pennsylvania): Further Hybrids of *Œnothera biennis* and *O.*

grandiflora that resemble *O. lamarckiana* (with demonstrations).

W. Johannsen (University of Copenhagen): Some Mutations in Pure Lines of Beans.

G. H. Shull (Carnegie Institution): New Place Effects and the Genotype Concept.

R. Pearl (Maine Agricultural Experiment Station): On the Mechanism of Inheritance of Fecundity in the Domestic Fowl.

T. H. Morgan (Columbia University): Associative and Mendelian Inheritance.

E. B. Wilson (Columbia University): Some Problems of Cytology in relation to the Study of Genetics.

D. H. Tennent (Bryn Mawr College): The Correlation between Chromosomes and Particular Characters Exhibited in Hybrid Echinoid Larvæ.

H. D. Goodale (Carnegie Institution): Castration in relation to Secondary Sexual Characters in Brown Leghorns.

R. K. Nabours (Kansas State Agricultural College): Inheritance in the Grous Locust (with demonstrations).

H. J. Webber (Cornell University): The Inheritance of Characters in Peppers.

All of the papers read before the Society will appear in series in the forthcoming numbers of *The American Naturalist.*

The following were elected to membership in the Naturalists: Alice M. Boring, University of Maine; H. L. Clark, Harvard University; C. D. Congdon, Cornell Medical School; H. K. Hayes, Connecticut Agricultural Experiment Station; E. P. Humbert, New Mexico Agricultural Experiment Station; F. Payne, University of Indiana; H. D. Senior, New York University and Bellevue Medical College; L. H. Smith, University of Illinois; L. R. Waldron, North Dakota Agricultural Experiment Station.

The following officers were elected for 1912:

President—Professor E. G. Conklin, Princeton University.

Vice-president—Professor R. G. Harrison, Yale University.

Secretary—Professor A. L. Treadwell, Vassar College.

Treasurer—Professor W. E. Kellicott, Goucher College.

Additional Members of the Executive Committee—Professor B. M. Davis, University of Pennsylvania; Professor H. E. Jordan, University of Virginia.

CHAS. R. STOCKARD,
Secretary 1911

THE WASHINGTON MEETING OF THE AMERICAN CHEMICAL SOCIETY

AGAIN the American Chemical Society has held the largest meeting in its history, 658 members and guests registering in Washington, and probably 700 were present.

The meeting opened on Wednesday, December 27, with a joint meeting of the Section on Chemical Education and the Division of Physical and Inorganic Chemistry, at which the following four papers were given:

A. A. Noyes (chairman): The Teaching of Physical Chemistry.

W. D. Bancroft: Physical Chemistry in the Introductory Course.

H. C. Jones: The Introduction of Physical Chemical Conceptions in the Early Stages of the Teaching of General Chemistry.

J. Howard Mathews: Some Applications of Color Photography in the Teaching of Physical Chemistry (illustrated).

In the afternoon the address of Vice-president Frankforter, of Section C, entitled "The Resins and their Chemical Relations to the Terpenes," was delivered before a large audience and was followed by an address by Chairman H. P. Talbot on the subject "Privileges and Responsibilities of the Chemical Analyst." Following Dr. Talbot, Dr. A. L. Voge, of the Library of Congress, read a paper on "Ostwald's Proposed International Institute of Chemistry."

Throughout the week the society's Divisions of Agricultural and Food Chemistry, Biological Chemistry, Industrial Chemists and Chemical Engineers, Fertilizer Chemistry, Organic Chemistry, Pharmaceutical Chemistry, Physical and Inorganic Chemistry and the Chemistry of India Rubber, held meetings in rooms especially assigned to them.

Some 500 were present at the "smoker" on Wednesday evening, which was fully up to the standard of the well-known smokers of the Chemical Society.

On Thursday evening Alexander Smith, president of the society, delivered his presidential address, entitled "An Early Physical Chemist," and was followed by an interesting lecture by Frank B. Kenrick and H. E. Howe, consisting chiefly of illustrations by means of the lantern of the effect of temperature, pressure, concentration, surface tension, osmotic pressure, etc., on reactions in heterogeneous systems.

A feature of the divisional meetings was the

Symposium on Mineral Wastes and their Conservation, held before the Division of Industrial Chemists and Chemical Engineers on Friday. The following papers were presented and the discussion was prolonged throughout the day:

J. A. Holmes: Carbon Waste.

W. H. Bassett: (*a*) Zinc Losses in Brass Manufacture; (*b*) Need of Special Alloys for Special Uses.

W. R. Whitney: New Uses to Reduce Abuses in Conservation.

A. V. Bleininger: Wastes in the Ceramic Industry.

A. D. Little: The Abuse of Brand.

F. K. Cameron: Waste and Conservation of Potash and Phosphoric Acid.

F. G. Cottrell: Sulphur Fumes and Flue Dust.

Charles L. Parsons: Miscellaneous Mineral Wastes.

This program, together with the papers given, will be featured in the March *Journal of Industrial and Engineering Chemistry.*

The Division of Pharmaceutical Chemistry held a Symposium on Drug Assaying on Friday morning and on Friday afternoon a joint meeting of the Society of Biological Chemists was held with the biological chemists of the American Chemical Society.

The secretary's report showed an increase of members of over five hundred for the year, the society's membership standing on December 1 at 5,603. During the year the society spent over $55,000 on its journals, returning to each paid member in actual cost of publications more than 100 per cent. of his dues.

At the meeting of the council on Tuesday afternoon and evening the Biological Section of the society was authorized to form a Biochemical Division, electing its own officers, and two new local sections were formed; one at Detroit and one at New Haven.

Interesting reports were received from the Committee on Standard Methods of Analysis and from the Committee on Patent and Related Legislation.

It was voted to donate the library of the American Chemical Society to the New York Chemists' Club on condition that members of the Society have ready access thereto.

The question of the time of the annual meetings of the society was vigorously discussed, many members favoring a change from the winter season to Easter week, and a committee was appointed to take this into consideration and report to the council.

The election of the following officers was announced for 1912:

A. D. Little, President; C. L. Parsons, Secretary; A. P. Hallock, Treasurer; W. A. Noyes, Editor of the *Journal of the American Chemical Society;* A. M. Patterson, Editor of *Chemical Abstracts;* M. C. Whitaker, Editor of the *Journal of Industrial and Engineering Chemistry;* E. G. Love and Alexander Smith, Directors for two years; S. W. Parr, W. H. Walker, W. L. Miller and W. D. Bigelow, Councilors-at-Large for three years; C. H. Herty, Councilor-at-Large to fill the unexpired term of A. D. Little; E. G. Love, G. C. Stone and A. E. Hill, Finance Committee; Wm. McMurtrie, C. L. Parsons and B. E. Curry, Membership Committee.

Over two hundred and fifty papers were presented at the meeting, abstracts of many of which will appear shortly in SCIENCE.

CHARLES L. PARSONS,
Secretary

THE AMERICAN PHYTOPATHOLOGICAL SOCIETY

THE third annual meeting of the American Phytopathological Society was held in Washington, D. C., December 27–29, 1911, in affiliation with the American Association for the Advancement of Science. A program of fifty-one papers was presented. Joint sessions with Section G and also with the Botanical Society of America were held. The present membership is about 240. The report of the business manager of *Phytopathology,* the official organ of the society, showed a small balance to the credit of the journal after all the expenses for the first volume had been paid. The present editorial staff and business manager of the journal were continued for the coming year. The following are the officers for 1912:

President—G. P. Clinton, Agricultural Experiment Station, New Haven, Conn.

Vice-president—F. C. Stewart, New York Agricultural Experiment Station, Geneva, N. Y.

Secretary-Treasurer—C. L. Shear, U. S. Department of Agriculture, Washington, D. C.

Councilors—W. A. Orton, U. S. Department of Agriculture, Washington, D. C.; Erwin F. Smith, U. S. Department of Agriculture, Washington, D. C.; A. D. Selby (*ex officio*), Ohio Agricultural Experiment Station, Wooster, Ohio; L. R. Jones (*ex officio*), University of Wisconsin, Madison, Wis.

C. L. SHEAR,
Secretary